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THE Soybean Digest

AMERICAN SOYBEAN ASSOCIATION
FOUNDED 1920 — ORGANIZED 1925

"Soybeans in the Postwar World"

Annual Edition 1945

Official Publication
OF
THE AMERICAN SOYBEAN ASSOCIATION

VOLUME 5 • NUMBER 11 SEPTEMBER • 1945

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THE Soybean Digest

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GEO. M. STRAYER, Editor KENT PELLETT, Managing Editor

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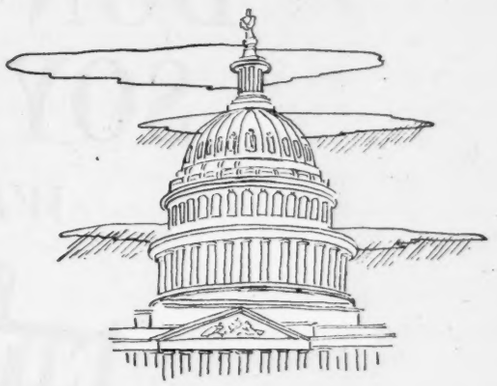

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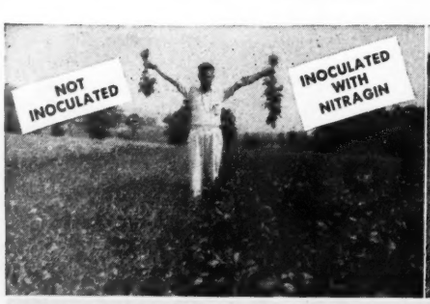
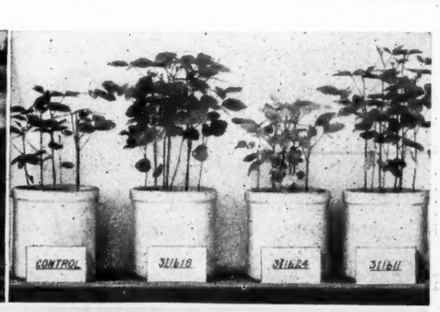


BIGGER YIELDS • Nitrogen-hungry soybeans on left (above) wasted the grower's labor and land. Soybeans inoculated with NITRAGIN (right) were a highly profitable crop.

SURER CROPS • Inoculated crop (above) had extra vigor to grow faster, crowd out weeds and make a good yield. Weeds ruined the weakling soybeans on left.



TESTED • NITRAGIN contains selected, tested strains of legume bacteria. In Nitragin greenhouse test shown above, the strain producing most nodules actually hindered growth.

SOYBEANS IN THE POSTWAR WORLD

When the theme for the 1945 annual edition of *The Soybean Digest* was chosen, the realization of Victory seemed far in the future. The postwar world was only a hopeful dream. Now peace has again become a reality, and the postwar era is being launched.

What will be the place of the soybean industry in that era?

Devastating and ruthless as war always is, this one has tapped unsuspected energies, and has caused acceleration in research, agriculture and industry to the point where a normal 10 to 25 years of progress have been telescoped into 5: the defeatism of the 30's vanished as we stepped forth to destroy the greatest military machines ever devised. Soybeans have shared in that war time progress and expansion.

It would be ridiculous to expect life in the United States ever to resume prewar patterns. The world of 1939 will never return.

What can we expect of soybean acreage in the new postwar world?

Last winter Ersal Walley, A.S.A. director from Indiana, predicted that postwar soybean acreage in his general area would be at least 80 percent of war time acreage, and that because of better varieties and cultural practices total production in that area would not decline noticeably.

Proper soil conservation practices in this country require that a significant cut be made in the acreage planted to tilled or cultivated crops. Soybeans will probably absorb some of that reduction. They have only begun their climb toward maximum per acre production. Improved varieties, improved machinery and greater knowledge of correct cultural practices will all contribute.

Soybeans have significant advantages in the competition for postwar acreage:

1. More pounds of high quality protein and more pounds of highly versatile vegetable oil can be produced on an acre of land by soybeans than through the production of any other crop. Such a combination of the two most essential food and industrial raw materials can not be ignored in agricultural planning.
2. Soybean oil meal during the war years has made an indisputable place for itself among livestock feeders. Protein consumption by livestock will undoubtedly continue at a much higher level than during prewar years.
3. Food and industrial usage of soybeans is destined to increase materially, becoming a greater factor in postwar markets. Industrial usage of proteins has only been scratched, with heavy expansion predicted. Foods usage seems destined to increase as restrictive regulations, such as that pertaining to soy flour, are lifted.
4. Soybeans will continue to replace unprofitable crops, as small grains, and will continue to supplement corn.

What of soybean oil?

Other oilseeds will continue to offer tough competition. The answer is tied up in our decision on a national policy toward imported fats and oils, which unquestionably can be produced more cheaply in tropical sections.

Charles Lund of the U. S. Department of Commerce believes that soybean growers have more to gain than to lose by a liberal tariff policy, designed to promote a high level of foreign trade. Citing lard as an example, he says that low tariffs should result in a large export trade in lard. But restrictive tariff policies, he says, may bottle up lard here at home and force it into ruinous competition with soybean oil.

Our practical soybean men are not convinced. They remember that the big expansion in soybean acreage came after the oil was given the benefit of tariff protection. They think the war time contribution of the soybean crop has entirely justified that tariff protection; that the availability of a superior edible oil during war time completely justifies peace time tariff protection. Veterans in the industry view the future somberly if we open the gates to a flood of cheap foreign oils.

Through the postwar years each product will rise or fall on its own merits. Unquestionably soybean oil is the most versatile of all oils produced in the United States. It is the only oil normally used in every industry listed by the Bureau of Census.

How well do we know the strength of our own crop? How well do we know the weaknesses?

Not well enough in the viewpoint of your editors. As a contribution toward increasing knowledge we offer this 1945 annual edition of *The Soybean Digest.*

Those who hoped that the leaders of the industry would lay the postwar world before them in a neat pattern will be disappointed. There are no final answers on these pages. The final answers will be drawn out of the farms, the factories, the research laboratories and the halls of government in the years ahead. Finding them will not be easy. Nor will it be cheap.

If we in the soybean industry move ahead with vision; with an understanding of our place in the pattern of the nation; with minds susceptible to change and with hearts stout enough to move undaunted through seemingly unsurmountable obstacles, then soybeans will have a substantial place in the postwar economy. The challenge is ours — the future of the soybean industry is in our hands.

How much shadow?

As the Rising Sun sinks in the far Pacific, how much shadow is cast over our soybean fields? To what extent will the return of tropical and far eastern oils force cutbacks in the tremendous new acreages of soybeans?

There is little doubt that world trade is going to be important to the organized peace for which the United Nations strive. Soybean products, then, must find a market on the basis of merit and price, and in competition with low cost imported oils.

Two factors can help soybeans to hold their own. One is Chemurgy, which continues to find new and marvelous potentials for industry in this unique plant product. We are just on the threshold of a new world of protein chemistry, and the protein-rich soybean may become its main source of raw material.

The other factor is a possible sharp reduction in the cost of producing soybeans. The Ford-Ferguson Tractor, with its revolutionary Ferguson System, has already shown thousands of soybean growers one way to cut their production costs radically.

With the Ford-Ferguson Tractor, every power job on the farm is done more easily, quickly and cheaply. Implements go on or off in a minute or two, and finger tip control takes the place of heavy muscular work.

Those are just two of many revolutionary features. A visit at the friendly Ferguson Dealer's will show you the full story of lowered production costs through this truly modern farming machine.

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1945

Annual Edition

AMERICAN SOYBEAN ASSOCIATION

President's Message

Now that the war is over, it seems proper and fitting that we should take stock of the soybean industry, recapitulating the past year's activities and project our thoughts toward the year 1946 and years in the future.

During the past 12 months the officers of your organization have taken active part in several conferences regarding the use of soybeans and soybean products in the edible food industry and we are glad to report that definite progress has been made.

Some of the projects with which we helped are as follows:

The United States Department of Agriculture (Pure Food Administration) ruled that the addition of soy flour to bread would be considered legal.

Another project on which your officers spent considerable time and effort was the decision ruling that soy products might be used in the manufacture of certain meat products.

We are glad to report that some progress has been made in the further utilization of soybean oil in both edible and inedible fat field.

We also asked for and received additional appropriations for the Regional Laboratory for the study of soybean diseases.

This has been a busy year and the correspondence and interviews necessary to advance the interests of the soybean grower have been voluminous.

THE RIGHT TO SPEAK

It is only as we take an active part in the development of new uses for soybeans and safeguard progress made in the past that we have the right to appear as spokesmen for the soybean growers of the nation.

Acreage of soybeans during the past 3 years has reached an all record high due to the desire on the part of the soybean growers to help our nation at war which at the outset of hostilities found herself extremely short of fats and oils. The guaranteed payment program to growers and processors suggested by the War Food Administration and administered by the Commodity Credit Corporation was of very definite help in encouraging the increased acreage of beans. With the cessation of hostilities, however, we may expect the patriotic motive of the soybean grower, which was to help out our nation and Allies, critically in need of fats and oils, to diminish, and we may also expect controls over the processing industry and guaranteed prices to producers to be repealed.

We therefore, in the year just ahead, will find ourselves on our own, so to speak, and many factors not yet determined, will influence the acreage of beans which growers will plant in 1946.

It might be well at this time to point out a few of the most prominent of these factors.

After the soybean leaves the possession of the grower, the oil is separated, as you well know, from the meal, and the residue is edible or inedible meal and oil. The livestock industry of our nation is by far the largest consumer of soybean oil meal and with the large livestock population now on farms and ranches we may well look forward to a favorable demand for soybean oil meal for livestock feed. Those manufacturers preparing food products for human consumption are becoming increasingly interested in the use of edible soybean oil meal in their products and we may look forward to a good demand from this source.

HOWARD L. ROACH

UTILIZATION OF THE OIL

The margarine industry and manufacturers preparing cooking oils and fats have been large consumers of soybean oil and have developed techniques for the satisfactory utilization of soybean oil. However, when other oils are available at lower prices, we may naturally expect that these other oils will be used unless we reduce our prices to competitive levels.

The attitude of our administration in reciprocal trade agreements will influence the amount of vegetable oils imported into our nation and will also influence the price at which these oils can be imported and therefore until we know what that policy will be, it is hard to forsee the price at which domestic soybean oil will be offered to the manufacturers desiring the use of this product.

As has been pointed out many times, soybean growers are farmers growing not only soybeans but all other farm crops and these farms are also the sources of the livestock of the nation and we cannot expect the soybean acreage to be maintained at its present high level unless the farmer finds soybeans to be as profitable a crop as others for which it must compete for acreage.

We growers have used up fertility of our farms in growing the tremendous crops which have been used to feed our own people, our armed forces and the nation-

SECRETARY JEANNE M. STRAYER

SGT. GEO. M. STRAYER

als of our allies. Therefore with the cessation of hostilities most of us will now be concerned with the restoration of that depleted fertility which will mean a reduction in the growing of inter-tilled acres and soybean acreage will suffer its proportionate share in carrying out that program.

If we soybean growers in the year just ahead will do our utmost to find new demands for our crop, safeguard the uses already developed by demanding that restrictive legislation is corrected, will strive for increased yields, keep aggressively interested in both plant and industrial research, then and only then may we be sure that the age-old soybean that found its new home in America, will continue to be an increasingly important crop for the American farmer.

Howard L. Roach, *President*

Report of Secretary

1944-45 fiscal year.

The operations of the office of secretary of the American Soybean Association during the 1944-45 fiscal year have been subject, as have all others, to governmental restrictions on materials. Some of the activities which normally would have been carried on have been sacrificed in behalf of the war effort.

The current year has been a profitable one for all phases of the industry. Acreage was large, yields good, quality excellent, and prices satisfactory. Wartime expansion of processing facilities, plus shipments of beans to foreign countries, have caused some temporary shortages of beans for processing, but the over-all picture has been highly pleasing.

Since the annual meeting of the Association in September 1944 the board of directors has held two meetings. One was held at Champaign, Ill., immediately following the convention, and one in Chicago in December. Steps toward the incorporation of the American Soybean Association were taken, and the committee which was authorized at the annual business meeting has since been carrying on its activities by correspondence. Definite recommendations will be ready for presentation to the next business meeting of the membership.

LEGISLATIVE ACTIVITIES

Legislative activities of the Association have been continued as in past years. Efforts to secure increased appropriations for soybean disease and insect studies were carried on in cooperation with other agencies, and were successful to the extent of a $70,000 appropriation for the 1945-46 fiscal year. Funds will be administered by the Bureau of Plant Industry, U. S. D. A. Representatives of the Association have been present at several meetings where legislative developments were under consideration. Restrictive legislation affecting soybean oil and soybean food products has received especial attention.

During the 1944-45 year the membership of the American Soybean Association has been steadily increasing, but membership promotion has been held to a bare minimum because of restrictions on paper supplies. With the recent release of those supplies we have immediately launched a campaign to increase the membership beyond present levels. One of the major problems of the association today is that of building the membership to the place where ASA will represent a sufficiently large portion of the soybean producers and handlers of the nation so that it can speak with authority for the industry. The problem is not a new one to us—it is our most important one.

During the year a fidelity bond has been purchased covering employees handling association funds, the office supplies and equipment have been covered by fire and theft insurance in accordance with action taken by the board of directors, and funds not needed for immediate operation of the Association were invested in treasury certificates. No significant changes or additions have been made in office equipment.

The time has now arrived when the war-expanded soybean industry must fight for its existence. Tropical fats and oils brought into this country on a duty-free basis will rapidly spell catastrophe for soybeans. The next year is going to be the most critical in the history of the American Soybean Association, because within that period of time the national policies pertaining to oilseed crops for the next decade will be formulated. Adequate Washington representation will be an absolute necessity. Constant vigil and frequent checking will be in order. Frequent contacts with representatives from the soybean producing states serving in the House of Representatives and the Senate will be a necessity. In my estimation the 1945-46 year is going to be the decisive year of the decade and it is going to require active and constant vigil by every member of the Board of Directors and every Association member in order to adequately protect the interests of the man who grows soybeans.

Adequate membership in the American Soybean Association among the growers of soybeans to completely represent the industry in legislative matters, and then the active participation of members and directors in accomplishing the legislative goals, are the two big problems of 1945-46, in the estimation of your secretary.

Respectfully submitted,
J. M. Strayer, Sec'y

—s b d—

BOARD WILL HOLD OVER

Officers and directors of the American Soybean Association have consented to continue in office until a convention of the Association can be held.

The customary convention was not held this September because Office of Defense Transportation restrictions on travel were relaxed at too late a date to allow time for adequate preparation for a convention.

Those who have consented to retain their offices for the present, are:

President—Howard L. Roach, Plainfield, Iowa. Howard is president of J. Roach Sons, Inc., and an officer in several affiliated companies. He is a well known Iowa farm manager. He can approach soybean problems from an exceptionally well rounded viewpoint since he is a producer and handler of soybeans, and operator of a soybean processing plant.

Vice President—Walter McLaughlin, De-

(Continued on page 74)

TAYLOR FOUTS | W. E. RIEGEL | C. E. CARTER | G. M. BRIGGS | W. J. MORSE | W. E. AYRES | W. L. BURLISON

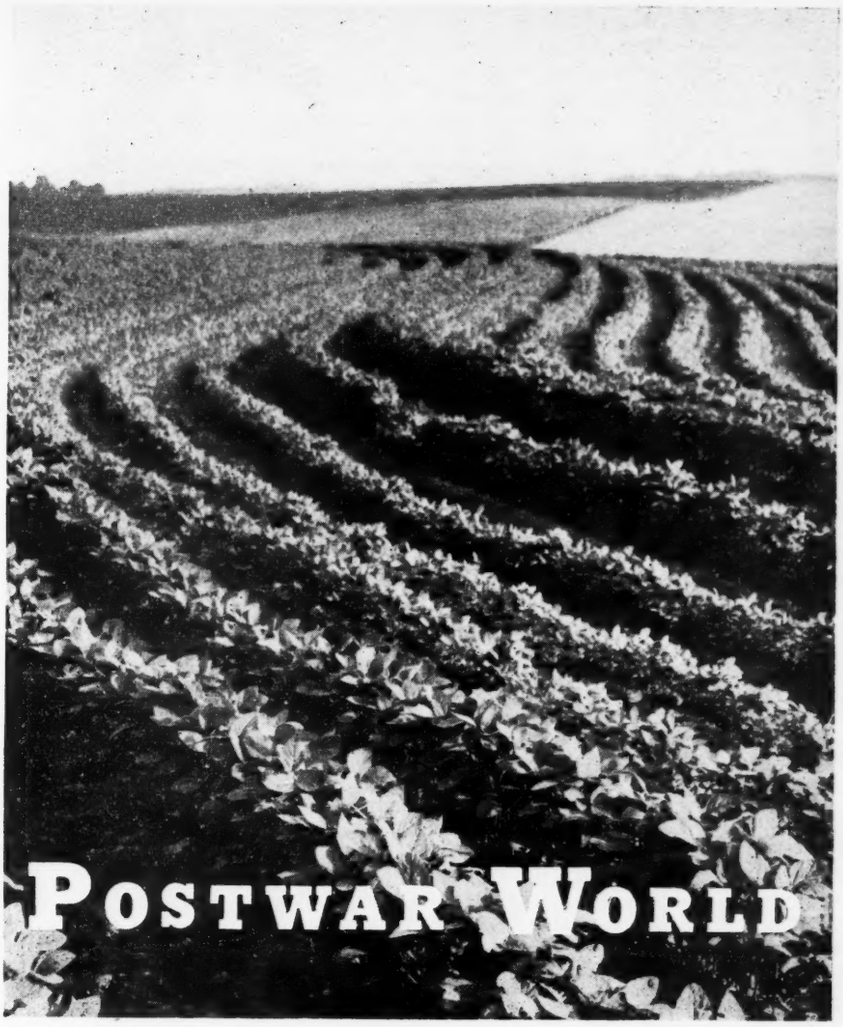
Presidents of the American Soybean Association

Twenty dynamic leaders from the ranks of producers and the universities have piloted the American Soybean Association through its first quarter century. They have guided the destiny of a crop whose rise has been without parallel in American history.

● *TAYLOR FOUTS, Camden, Ind., 1920, 1928,* was growing soybeans 40 years ago, and spoke at the Silver Jubilee meeting in 1944 ● *W. E. RIEGEL, Tolono, Ill., 1921,* pioneered with the late Charles Meharry in soybeans and lespedeza, still manages the Meharry lands in Champaign County ● *C. E. CARTER, Columbia, Mo., 1922,* was formerly field crops specialist at the University of Missouri where he was responsible for extension work in soybeans. Now he is with the U.S.D.A. ● *G. M. BRIGGS, Madison, Wis., 1923,* has been interested in soybeans since he was Burnet County agent 25 years ago. As University of Wisconsin agronomist, he once established soybean test plots in 40 Wisconsin counties. ● *W. J. MORSE, Washington, D. C., 1924, 1925, 1932,* made the famed trip to the Orient for soybean varieties, is principal agronomist with the U.S.D.A. Bureau of Plant Industry ● *W. E. AYRES, Stoneville, Miss., 1926,* as director of the Mississippi Delta Branch Station was active in soybean work throughout the upper Mississippi Delta. He died in 1938 ● *F. P. LATHAM, Belhaven, N. C., 1927,* is still a large plantation owner near Belhaven where he has been growing and handling soybeans for more than 35 years ● *G. I. CHRISTIE, Guelph, Canada, 1929,* president of the Ontario Agricultural College, he was formerly director of the Indiana Experiment Station and a booster for soybeans ● *W. L. BURLISON, Urbana, Ill., 1930,* has been bellwether for Illinois soybeans for a quarter of a century, and head of the Department of Agronomy at the University ● *W. C. ETHERIDGE, Columbia, Mo., 1931,* head of the Department of Field Crops, University of Missouri for 19 years, has seen the soybean acreage grow from a few rows under his supervision to 750,000 acres.

● *JOHN GRAY, Baton Rouge, La., 1933,* is agronomist at the University of Louisiana, has seen the soy crop retain its importance in that state since the boll weevil first drove farmers to its use. ● *C. K. McCLELLAND, Fayetteville, Ark., 1934,* is still agronomist at the Arkansas Experiment Station ● *K. E. BEESON, Lafayette, Ind., 1935,* as extension agronomist has spark plugged the crop in Indiana since 1924, has seen the acreage jump to a million and one-half ● *E. C. DYAS, Ames, Iowa, 1936,* extension man at Iowa State College, has been interested in soybeans since 1923. He cooperated with the Rock Island and Illinois Central Railroads in their educational work in the late 30's ● *J. C. HACKLEMAN, Urbana, Ill., 1937,* as extension agronomist is one of the reasons why Illinois leads other states in soybean production. Long a prop for the Association ● *J. B. PARK, Columbus, Ohio, 1938,* associate in agronomy at the Ohio State University, he produced Evergreen sweetclover and Ohiogold sweetcorn in addition to the Mingo soybean ● *G. G. McILROY, Irwin, Ohio, 1939, 1940 and 1941,* president of Farm Management, Inc., a director of the National Farm Chemurgic Council, he has been active in the Association's legislative work and in the founding of the *Soybean Digest* ● *D. G. WING, Mechanicsburg, Ohio, 1942, 1943,* as operator of 3,000 acres of farm land since 1922, his chief interests are alfalfa and soybeans. He has been active for years on the Association's legislative committees ● *J. E. JOHNSON, Champaign, Ill., 1944,* manager of 78 farms in Champaign and surrounding counties, he perhaps has charge of more soybean land than any other man in America ● *HOWARD L. ROACH, Plainfield, Iowa, 1945,* president of J. Roach Sons, Inc., is interested in soys as grower, handler and processor.

W. C. ETHERIDGE | K. E. BEESON | E. C. DYAS | J. C. HACKLEMAN | J. B. PARK | D. G. WING | J. E. JOHNSON



Soybeans IN THE POSTWAR WORLD

By E. F. (Soybean) JOHNSON

Manager, Soybean and Oil Meal Division
Ralston Purina Company, St. Louis, Mo.

• Whither the miracle bean? A thousand and one factors, from the tariff to the acreage of King Cotton, bear on the answer to that question. The author, one of the most experienced men in the soybean industry — he has been associated with it as grower or processor, since 1911—leads off with a highly stimulating discussion.

SINCE I am not a prophet, not endowed with any peculiar visionary aptitude, my acceptance of assignment, "Soybeans In Postwar World", must come under the old adage—'Fools rush in where angels fear to tread!' Such a status naturally gives me unlimited rights in selecting the method of treatment of the subject.

Rather than be guilty of the error of many prognosticators in trying to convince the audience (readers in this case) of the logic of their deductions, I prefer to cite as completely as time and space will permit, the factors that will in the end determine the place of soybeans in any era. In such an approach a few fundamental questions must be considered: (1) Why do farmers grow soybeans? (2) Why are plants built for processing soybeans and soybean oil? (3) Why do consumers buy soybean products? A correct and complete analysis of these three questions will give any analysist the answer to the major issue, "Soybeans In Postwar World."

In spite of all camouflage as to why people do things; why laborers work in a mill, why farmers plow fields, why money is invested in enterprise, why soybean oil meal is fed in place of something else, the final answer in the end always pivots around "money", or in a nicer phrase we all like better, "profit". Some would interpret this as "better living standards", "higher plane of civilization", or even "better world conditions". Regardless of what you call it, all are thinking of money to be received, or profit.

PRICE OF SOYBEANS

The price of soybeans is the major issue. To the grower the price of soybeans means price per bushel, times bushels per acre, less cost of producing, plus any bene-

ficial soil effects. To the processor the price of soybeans means what he can afford to pay for a bushel of soybeans. This price will always be the value of the products produced, less the cost of producing and marketing these products, less a reasonable profit. To the consumer of soybean products the price of soybeans means what he is willing to pay for these commodities as compared to the cost of similar competitive products.

Strange as it may seem, but in a free economy the last five words in the preceding sentence determine price per bushel of soybeans. In other words, "cost of similar competitive products" will in the end determine the price the grower will receive for the soybeans he grows. With this brief review of our basic economics, we can now consider some of the uncertain factors that will determine the place of soybeans in postwar era.

GOVERNMENTAL REGULATIONS

An emergency factor that nullifies many of the basic economic influences, is governmental control of all oilseeds and a law requiring the government to guarantee 90 percent of parity prices for a 2 year period following termination of war with Japan. During this 2 year period the future of soybeans through subsidy to growers and others, might easily be expanded to a pinnacle of mythical size that would collapse like the well known bubble. On the other hand, soybean utilization might suffer untold damage by drastic penny-pinching whims. The parity price, or any governmental price established, is by itself of little importance. The issue becomes, "What is the relationship of any such established price to prices of other farm commodities?" The net return per acre as compared to that of other crops will determine the acreage of soybeans, not only in the 2-year postwar era, but always. If ceiling and floor prices are continued on soybean products their relationship to prices of all other similar products is the issue. Many of us doubt if a correct relationship between such commodities can ever be determined without the constant aid of free and unhampered markets and a return of normal distribution methods.

RECIPROCAL TRADE AGREEMENTS

The new reciprocal trade agreement gives the president power to reduce the existing duties of vegetable oils and meals by 50 percent. The story of the growth of soybeans in the U. S. has many chapters dealing with the serious threat of cheap foreign oils and meals. Older members of the American Soybean Association are only too well aware of the battle of existence resulting from the flood of these products. A 50 percent reduction in duties

"SOYBEAN" JOHNSON

and tariffs on foreign vegetable oils and meals could reduce the present 200 million bushel yearly crop to a few million and bankrupt every processing plant in the U. S. Will efforts to appease political relationship with neighboring nations sacrifice the soybean grower and industry?

COMPETITIVE CROPS

The major competitor of soybeans is King Cotton. Many proposals are under consideration for a solution of the cotton problem, and although these proposals differ widely, they are all predicted on a drastic reduction of cotton acreage. Such a reduction will naturally reduce supplies of cottonseed oil and meal thereby increasing the outlet and demand for soybean oil and oil meal. Will the South replace much of this cotton acreage with soybeans and by so doing actually increase the total supply of vegetable oil and vegetable oil meals?

BETTER LIVESTOCK FEEDING

Some energetic and possibly ambitious animal nutrition expert has worked out data to prove that if all livestock and poultry were fed correct rations, it would require eight or ten times as much total protein as is used today.

There can be no question but that conditions the past 3 years have developed much improved feeding of livestock and poultry. Will that improvement continue? Will we hold gains already made if prices drop to even favorable pre-war levels?

Personally, the question perplexes me. Everything I read proves that a balanced ration—one with all the required protein—results not only in cheaper gains or production, but *invariably* these cheaper gains are the *direct result* of consuming *less total feed.* So I am bothered—if everybody feeds balanced rations, then eight times as much protein will have to be fed, but 20 percent less feed will be consumed. The books don't balance if we continue the same total acreage in cultivation.

FOREIGN DEMAND AND EXPORTS

There is today a very great demand for feed and food for export. This demand, a direct result of war, invasion, destruction, etc., is very difficult to evaluate. Under our lend-lease program, countries and people naturally want everything they can get for nothing. However, we must remember that the population of these countries has been reduced by millions; that most of the agricultural lands will be restored quickly; and with better methods, American machines, possibly with American boys, operations might easily result in a future total food and feed production that would far exceed prewar production. Purchase power of all these countries will be very low or nonexisting. Their future will depend on becoming self-sufficient in feed and food as quickly as possible.

FOREIGN OIL IMPORTS

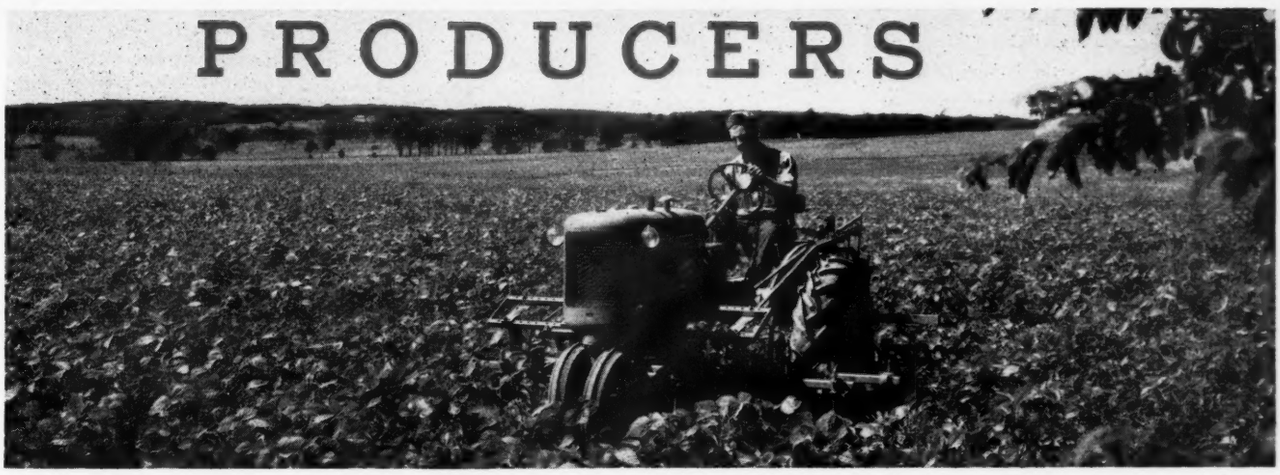
I have no reliable information on how much damage has been done to foreign (including Philippines) sources of vegetable oil. Neither do I have information as to how soon any of the seeds (and copra) might be shipped to the U. S. I do feel that in possibly a shorter time than we think, these vegetable oils will be in our markets in ever increasing amounts.

NEWER SOY PRODUCTS

Here is a field where great changes and expansion are possible. Soy flour, vegetable soybeans, vegetable outlets, glue, plastics, foam for extinguishing fires, balm for bald heads, base for spray compounds, synthetic rubber, etc., etc., are only a few of the newer products, any one of which might change the entire outlook.

Soy flour, vegetable soybeans, vegetable protein and other products classified as for human food consumption represent one field of advancement. Soy flour production has increased 10 times in the past few years and, although most of this increase has gone on lend-lease, yet recent developments indicate a large increase in domestic outlets. All products in this group are causing deepest study by economists and nutrition experts. The question is, might we not supply an increased amount of the protein requirements by a more liberal use of vegetable proteins and save the waste encountered in converting the same proteins into animal proteins? The scientist who answers that question may win highest world award for solving the problem of undernourished classes and nations and

(Continued on page 31)



SOYBEAN DEVELOPMENTS
In Indiana

• The following pages will deal with soybeans from the standpoint of the men who produce them. Mr. Biddle, of Biddle Farms, Remington, Ind., farms 640 acres located in the heart of Indiana's most intensive soybean producing area. He is one of the organizers and prime movers in the annual Remington Soybean Show.

By CHESTER B. BIDDLE
Remington, Ind.

INDIANA is destined to retain soybeans in rotation as a major crop. The general trend among progressive Indiana farmers is definitely toward meeting the problems that will have to be considered in the adoption of such a rotation. The fact that producers are making adjustments and studying these problems is very encouraging when you think in terms of the future for soybeans in Indiana.

Your author is located in the geographical center of the four Indiana counties, Benton, Jasper, Newton, and White. In 1944 these four counties produced more bushels of soybeans than any other four counties in Indiana. It is not unusual for single producers in the area to have 200 acres of beans; 80 to 90 percent of the farms have beans in their rotation, and 90 to 95 percent are planted in rows and cultivated. Wartime need for fats and oils has increased the number of farms involved as well as the acreage grown. However the acreage produced by amateur producers due to government needs is low.

It is logical reasoning to expect a cut back in acreage when the war time demand ends to an amount that will probably compare to that grown in the middle thirties. The producer who is not well equipped to handle beans and who did not include them in his rotation previous to government support will probably not be a producer after the end of the war. However more and more farm operators are thinking in terms of insects, drought, and labor distribution. Often the faithful soy looks fine when the chinch bug, corn borer, or drought menace other crops. While farm operators are planning some reduction in bean acreage, they are also planning a reduction in corn acreage, and in this territory plans seem to indicate that the reduction of these two crops will be comparable. Undoubtedly most farms will carry a greater acreage of small grain in order to get clover than has been the practice during the war years.

We can get a clear cut picture of the popular trend of soybean production in Indiana by referring to U. S. D. A. reports from 1928 to 1944 inclusive which are quoted below:

Soybean production in Benton, Jasper, Newton and White counties.

Year	Acres
1928	16,000
1932	30,400
1936	67,000
1940	87,600
1941	95,300
1942	138,500
1943	151,000
1944	149,300

A quick survey of these figures shows that these counties have made a steady and rather rapid increase in acreage from 1928 to 1944. The growth up to and including 1941 was not prompted by government demand or price support, as were the years of 1942, 1943, and 1944. It seems reasonable to believe that postwar Indiana will continue to produce beans on a scale comparable to the production in the years 1928 to 1941.

While our bean acreage has increased and has taken an important role as a cash crop, various objections have developed and in some cases have caused a cut back in acreage grown. Three very common and often heard objections are: the soy is a soil robber; clover failure in small grain sometimes results following soys; the soy presents harvesting and marketing difficulties.

Until very recent years the average Indiana farmer has attempted to put beans in his rotation without considering them as a soil depleting cash crop. The fact that they will grow comparatively well on soil with a low fertility level has resulted in many mistakes being made. In many cases the soy has been regarded as a substitute to be used when and if it becomes too late to plant corn.

On several farms these rotations are used:

(1) Corn-soys-corn-soys

(2) Corn-soys-soys-small grain (with

an attempt to get a stand of clover seeded in the small grain.)

In these rotations little if any fertilizer is included. If fertilizer is used at all it will consist of 50 to 100 pounds per acre applied to corn. These practices have resulted in some real trouble with the soy getting the blame. However in many cases more desirable rotations are being worked out with more attention to the fertility requirements of the crops grown. Experienced producers are reporting higher yields of both beans and grain following the adaption of desirable rotations along with a reasonable fertility program.

CLOVER FAILURE

Probably the most serious objection is the clover failure problem. Until very recently approximately 90 percent of the soy growers in the area reported unsatisfactory clover stands following soybeans. However with the more liberal use of commercial fertilizer on small grains, about 50 percent of the growers are making favorable reports as to clover. On this farm we have never experienced a total failure of clover in small grain following soys. In my opinion the greatest factor contributing to securing a satisfactory stand of clover is the maintenance of a good fertility level. On this farm an attempt has been made to maintain and improve the fertility by the use of commercial fertilizer in liberal amounts. It is the custom to apply 200 pounds to corn of 3-12-12 with some 300 to 400 pounds being applied to small grain. As a result our beans yield well after corn and our clover stands are good.

Due to an insufficient number of combines there have been several acres of beans that have remained in the field beyond the suitable harvesting period until the last few seasons. The low priced small combine is efficiently solving this problem. In this area more than 50 percent of the producers own and operate their own combines and this number will be greatly increased when new combines become available.

With the processor and the elevator man giving more attention to facilities for handling the crop early in the fall, with the producer giving more attention to fertility problems, and with the smaller combine becoming more common, some of the big objections are sure to become small ones if they exist at all.

As we are forced to give more attention to the corn borer, it is noticeable that many of the more progressive farmers are thinking of rotations that include soybeans. On one farm in Benton County a 4-year rotation of corn-soys-oats and clover is being used with satisfactory results. The deciding factor in adapting this rotation was corn borer control. While entomologists talk and write about the chinch bug and the corn borer, more and more of the farmers in this territory are giving soybeans a bigger place in their rotation.

Without a doubt the soybean can stay in Indiana and stand on its own merits. Adequate equipment for growing, harvesting, marketing, and processing is rapidly being acquired. Farmers and scientists are joining hands in attacking problems of fertility and clover failures. Drought, chinch bugs, and corn borers have caused an increase in soy acreage and have not affected the yield materially.

That the Indiana farmer likes to produce soybeans is a certainty. That the processors can find a suitable outlet for oil and meal that will allow them to pay a suitable price to the farmer is not certain. It is perfectly obvious that when the war terminates soybean oil will be in competition with tropical and far eastern oils as well as certain domestic fats and oils. An overproduction of soybean oil could materialize that would be a real detriment to the entire industry. The very real problem we face today in Indiana and the entire country is to find more use for soybean products. A satisfactory solution to this problem will insure the future success of the entire soybean industry. The capable men in the industry must use every means at their disposal to develop soy products so that the future of the soybean in the United States will be assured.

WESTERN IOWA POINTERS IN

GROWING and HARVESTING *Soybeans*

By FRED HAWTHORN
Castana, Iowa

WE BEGAN raising Mukden soybeans back in 1935. For the past 2 years we raised certified Richlands for seed purposes and in 1944 we started with new Lincolns. The 10 acre field of these beans yielded forty-two and a half bushels per acre as reported in the May 1945 issue of *Country Gentleman*, Encouraged by this record yield we planted 100 acres of certified Lincolns this year.

These beans were planted between the 19th and 28th of May, a trifle earlier than last year. A double listing planting method was used since past experiences with both corn and beans has proven it best for weed control. Last year, in spite of a wet spring, our double listed beans were almost weed free and practically no hand work was necessary after cultivation. I began to believe that we had found a bean culture practice that would eliminate the dreaded hand weeding. This year, however, has proven that we were just kidding ourselves. The beans were planted between successions of heavy rains and floods that mudded under the beans and, together with near freezing weather, caused beans to be 3 weeks in coming through the ground. Weed seeds, normally confined to the ridges and sides of ditches, were washed into the row and the weeds emerged with or ahead of beans and could not be covered with cultivators. As this is written my wife, two children, and I have just finished hand weeding the 100 acres, and if I should put it to a family vote, I fear the verdict would be no more beans for the duration of hired helpless farming. No fooling, this hand weeding soys is "stoop labor" of the worst type. We tried to hire some girls and small boys from town, the only help available. They did their best but, not being used to the work and heat, they just couldn't take it.

Instead of plowing in the spring we use a two-row listing plow to form ground into beds 40 inches apart. At planting time this same tool is equipped with subsoilers with wheels spread to two-row width. The rear tractor wheels are also set out to run in the old ditches and, so adjusted, the outfit is self steering with lister bottoms accurately splitting the old ridges. This second "middle-busting" operation stirs all the ground about the same as plowing and obliterates all weed growth that has started on old work. A regular corn planter, hooked behind lister with a stub tongue, plants beans in the new ditches in a once-over operation. We drag heavy blocks of wood behind subsoilers to crush clods and tire chains behind planter to mulch ground and complete the cover. We like this job much better than using a lister with its own planting attachment because it produces a finer, more compact seed bed so necessary in getting a good stand of beans.

LISTED BEANS

These listed beans are first "thrown out" with a lister corn cultivator, commonly called a "low down". We prefer to use our regular mounted tractor cultivator

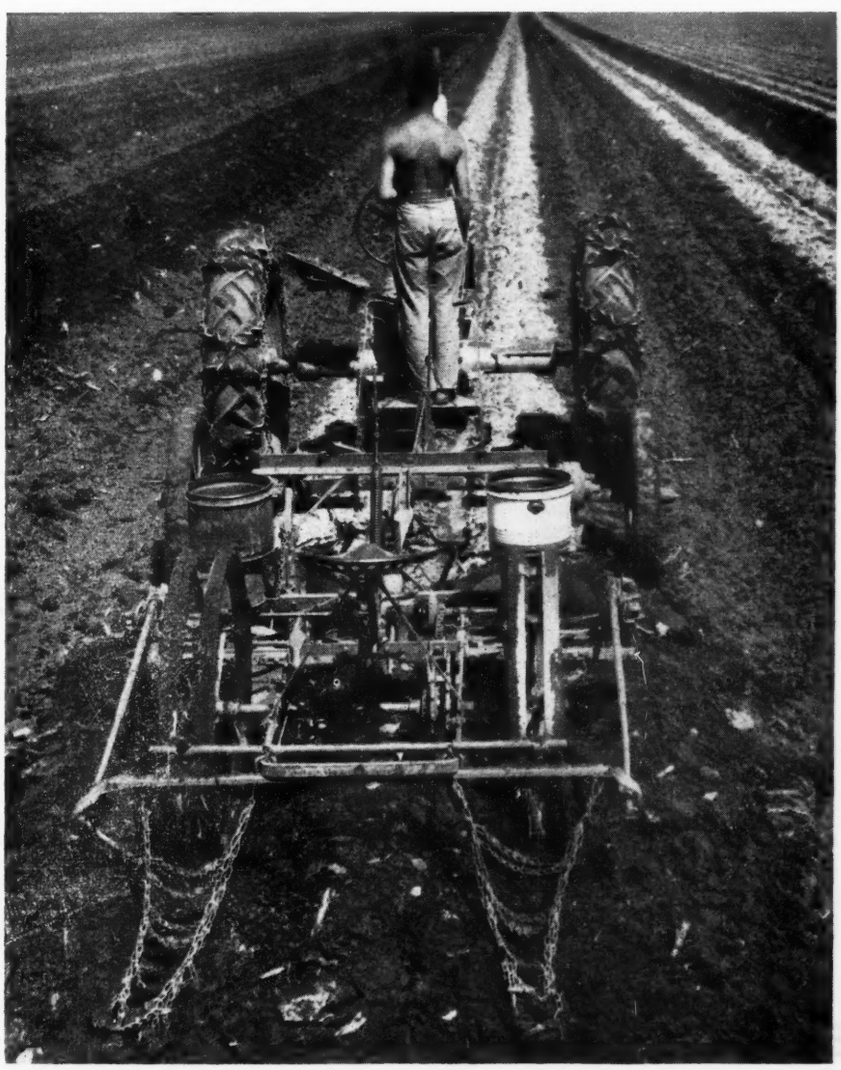
• *Mr. Hawthorn gives a good description of soybean production in western Iowa.* COUNTRY GENTLEMAN *recently published a very interesting article by him which related his experience in growing Lincoln soybeans.*

to cultivate in the ridges in the second operation, using 10-inch sweep shovels in front and a spring tooth attachment behind to dig up wheel tracks and complete the kill of weeds. By a proper adjustment of shovels and tractor wheels the outfit can be made self steering on the ridges and a very high quality job may be done with a minimum of effort. A light laying by cultivation is given beans just before they spread across rows.

In fields where there are stumps and use of a lister is impractical, we plow ground and plant with disc furrow openers on planter. We have found more hand weeding necessary in beans so planted, than in our double listed beans. After all, the best cultural practice in any locality will usually be the one that produces best weed control in growing corn. A good seed bed is a necessity and, of course, seed should be innoculated.

We try to leave the ground absolutely level after last cultivation to make possible low cutting with combine with a minimum loss of low-growing pods. I might state here that Lincolns beans do not pod as close to the ground as Richlands, but they do branch out more and, due to excessive rains this year, they are tending to vine out horizontally rather than vertically. We find, however, that combining lodged beans can be done quite efficiently if the combine is properly equipped. We use special inside and outside dividers and two inner grain-saver fingers set to travel close to the ground on both sides of each row. This equipment gets under the down vines and raises them above the sickle and into the feeder. Both inner and outer ends of reel are covered with sheet metal to prevent vines from catching and wrapping on ends of reel slats. A slow speed sprocket is used on reel to reduce shatter loss. Using one-half the cylinder speed recommended for small grain, we get around 3 percent of split beans at fanning mill.

"Ridge busting" and planting soybeans in a once over operation. A tandem hookup of 2-row lister and corn planter.



CUP-TYPE ELEVATOR

Last year we had to scoop all our seed beans into the bins, as our portable elevator cracked more than the combine. This year I made a vertical cup-type elevator; I also made an auger to fit into fanning mill to deliver beans from mill into elevator hopper. When beans are combined this fall, they will be scooped from wagon into fanning mill where they will be cleaned and augered into elevator and into bins without further handling. A test on this elevator showed that a one-third horsepower motor handles it easily, elevating around 150 bushels of beans per hour with absolutely no cracking.

Thanks to a month of family "nigger work" we have a nice looking 100 acre field of Lincoln beans. The vines now completely cover the ground between rows and beans are forming in pods. Given a decent fall, we should have another good bean crop. I guess we shouldn't complain too much after all, since 1945 has been the toughest season on record so far as getting weed control on any row crop is concerned. We still believe Lincoln beans are tops for this territory and hope our field will meet certification requirements this fall.

—s b d—

PROCESS FOR PEANUT MEAL

A simple, inexpensive method for removing the dark-red color from peanut skins has been found at the Southern Regional Research Laboratory of the U. S. Department of Agriculture in New Orleans. The development of this decolorizing process removes one of the greatest obstacles to the production of peanut protein for certain industrial purposes.

The manufacture of peanut protein is complicated by a serious color problem, because of the dark red skins of some varieties of peanuts. The process, which was the discovery of R. S. Burnett and his co-workers in the Southern Laboratory, consists simply in washing shelled peanuts in a cold dilute lye solution, rinsing the kernels to remove excess lye, and drying to the right moisture content for the preparation of the meal.

Soys in Cotton Country

By LYMAN REED
Missouri Soybean Co., Caruthersville, Mo.

IN THE beginning there was confusion. We planted Illinis and sometimes harvested 12 bushels per acre. We planted Delstas which grew as high as the barn roof and yielded practically no oil. We planted Mammoth Browns, Mammoth Yellows which couldn't be harvested unless we sat under them with buckets and caught them as they popped out. There were Mamloxis, Richlands, Dunfields, Mamredos, Tokyos, Macoupins, Chiefs—we learned a little about soybeans from these and from others too. Finally, it was the "Arksawyer" and from Arksoy came the Ralsoy, then we perked up.

The southeast Missouri-northeast Arkansas-west Tennessee alluvial region can grow literally anything and of course beans are a natural. This is cotton country listed at the very top of all producing regions. In eight seasons soybeans have come to occupy the second highest number of acres among all crops. Presumably we have just begun because our awkwardness in production and handling practices are visible to almost everyone.

WHEN PROPS ARE GONE

We are constantly being asked "what about soybeans when the props are knocked out?" We don't have a smooth answer to that one but we do have some broad hints to drop. A lot of the future destiny of soybeans lies within the control of the farmer. Stepping up his yield per acre is largely his own responsibility and he can achieve that, in part, by listening closely after we get through digging up all the factors that contributed to the yield of 52 plus bushels that McCullough harvested last year then copying as nearly as he can. He can look over the fence at Handley and watch him use $3.75 worth of fertilizer and gain $17.00 per acre over the unfertilized acres and, for good measure, toss away the idea that this land does not need fertilizer. He can go on from there and observe that throwing a ridge of dirt under the plants is unnecessary, is causing him a very rough ride at harvest and consequent shrinkage in yields. Finally he is learning to take more pains. Usually when in his field with his combine he moves carefully in second gear. When he gets over in his neighbor's patch he gets fired with ambition to go places, slips her in high and takes off. Some of the beans get in the bag, some go on out with the straw. The dirt he gouges up and the trash he doesn't separate would collectively fill a flotilla of flatboats. Sometimes when we tell him he has left his scalping screen off, or that his air stream has a regulator on it that should be used as atmospheric moisture changes, he wonders how we knew what he was doing out there on the back forty.

All that comes under the head of know-how and we all finally get around to that. However, good production practices must be paced by constant improvement in varieties. That improvement must come from us of course. Unfortunately we can't take the easy way of reaching out and borrowing those good strains from our neighbors, soybeans being what they are. A valiant handful of plant engineers are selecting and breeding with some success. A low bow to Heartsill Banks for evolving the Ralsoy and a kick in the pants to H. Banks for not sticking around and moving the Ralsoy a notch or two upward.

Soybeans are screwy things. All over this region farmers and scientists look upon the Ogden with a mixture of fascination and disgust. It outyields everything, almost always showing 40 bushels and not infrequently 55. But Ogden shatters at least one-fourth unless you are standing by with the combine and even then you'll lose too many. But in Mississippi County, Mo., next door to us, there is no complaint of shattering, even when harvested at leisure. That record offers hope that perhaps, someway, we can house-break Ogden for the rest of the region. If we can, that accomplishment will go a long way toward answering the postwar question.

WHY YIELD VARIATION

The scientist, and other inquiring souls, will be obliged to discover the reasons for the wide variance in yields. The general average is around 22 bushels. However, the number of yields found in the 40 to 50 bushel range is large enough to set up that figure as an easy potentiality. We must find the reasons and broadcast them and we shall do just that sooner or later. We already know a little, for instance the best yields usually come from the best land. There is also some consistency between the best yields and the best farmers. We also have learned that March and April planting does not produce the yields that May and early June planting does. Early planting produces plant out of proportion to beans and probably to the exclusion of part of the beans.

Most of our beans move south and southwest to cottonseed crushers and that is logical enough. A number of plants in the region adjacent to this producing area are semi-idle because, for one reason or another, nearby cottonseed production has receded from them. These plants are managed by estimable gentlemen who knew what the score was before they started monkeying with soybeans. Now they are wondering what hit them. One of our friends is an eminently successful cottonseed crusher, having built up a mill from a somnolent condition to a number one outfit. After he had bought his first 100 cars of soybeans he remarked to us that, according to his calculus and his slide rule, he would make a little money. After his crush he announced he had lost. His experience is typical.

The crusher casts a wary eye at that unpredictable, inscrutable entity called Commodity Credit Corporation. It is possible that that child of the bureaucrats is

(Continued on page 64)

• *Mr. Reed has been a soybean enthusiast for 15 years. He and his associates in Missouri Soybean Co. handle large quantities of commercial and seed beans. He was the first man to bring certified Chiefs into southeast Missouri.*

Twenty-Nine Years with SOYBEANS IN OHIO

By J. B. PARK
Department of Agronomy, Ohio State University

WHEN I moved to Ohio in 1916 soybean fields were hard to find. The only important use for the crop was hay where clover failed. The Experiment Station had tried out a long list of varieties mostly supplied by W. J. Morse and had chosen the best. These were being grown by a few pioneering farmers and seedsmen who produced seed and sold it for $3 to $5 a bushel, sometimes more. Unsold beans and those unfit for seed were fed to livestock.

The chief varieties being grown at that time were Ito San and Black Eyebrow for early varieties, Elton and Medium Yellow, (later renamed Midwest), for midseason; Medium Green, Wilson 5 and Virginia for late varieties. All of these have disappeared except Wilson and Virginia which are still used somewhat for hay in southern Ohio.

A few years ago the Indiana Station had growing at Lafayette as part of a soybean field day demonstration, some of the old timers alongside of the important commercial varieties and some promising new experimentals. The contrast between the old and the new was striking without any yield data. K. E. Beeson described the situation by saying "Don't you wonder why anyone wanted to grow soybeans when those were the best they had"? The plants lodged badly and soon after maturity the beans shattered from the pods.

Methods of harvesting the seed crop were the binder, the mower with windrower attached and the old self-rake reaper. Threshing machines were adjusted for beans by changes in cylinder speed, in concaves and in screens. In a dry fall these methods worked fairly well but in wet weather crop losses were heavy. Only a high price for beans could justify the trouble, risk and cost of growing soybeans for seed.

LACK OF MARKET

Another deterrent to expansion of acreage for seed harvest was lack of a ready market for surplus beans. Usefulness of the raw beans for livestock feeding was and still is sharply limited. Soybean oil meal was known to be an excellent protein concentrate for livestock feeding and a large market already existed for the oil. But processors would not build oil mills in Ohio until they were assured of a supply of beans, and growers would not produce beans until a market was assured.

Gradually the stalemate was broken by a series of events. Better varieties came that resisted lodging and shattering and yielded more. Most important of all was introduction of the combine which greatly lowered the man-hour requirement and reduced bean losses due both to bad weather and to shattering in handling. The combine made large scale production of soybeans possible.

An event that suddenly lifted soybeans out of the bush league and into the major league occurred in Illinois in 1928 when the American Milling Co. agreed to equip a large oil mill for soybeans and to guarantee a minimum price for 1 year. The resulting deluge of beans showed that farmers were ready to grow them. The movement gained momentum and by the spring of 1935 oil mills in Ohio were offering a convenient and unlimited market for soybeans. As a result Ohio's production of soybeans jumped from 41,000 acres in 1934 to 124,000 in 1935, and rose steadily to a maximum in 1943 of 1 1/3 million acres.

• Dr. Park, who is associate in agronomy at Ohio State University, has seen the soybean crop develop from its first crude beginnings in that state. He produced the Mingo variety.

EXPANSION UNIQUE

The expansion of soybean acreage in the Cornbelt states in the thirties is a phenomenon unprecedented in farm crop history. It is the dramatic result of an attempt by farmers to find an answer to certain economic problems, chiefly the unprofitable market for their large oat crop. The movement was made possible by the coordinated efforts of three agencies working in cooperation with the farmers. They are (1) the experiment stations and extension services which produced and popularized superior varieties; (2) the implement manufacturers who perfected the combine; (3) the soybean processors who provided a cash market for soybeans. Working with the farmers they have achieved the mutual benefit of all and have given the green light to a new American industry.

Along with increased acreage of soybeans in Ohio has come a steady rise in acre yield. If the 20-year period from 1924 to 1943 be divided into five-year periods the average yields of the four successive periods are 13.3, 16.1, 18.7, and 19.8 bushels. Just what caused these increases is difficult to determine but probably the greater part of it is due to better varieties together with better harvesting methods. Manchu, introduced in the early twenties was the first important new variety, superior both in yield and resistance to shattering. It was so good that 20 years later, in 1943, a survey showed that Manchu and the several pure line selections made from it still occupied nearly half of the Ohio acreage.

For years northern Ohio had been asking for a high yielding early variety. The first satisfactory one to appear was Richland, a product of the U. S. Department of Agriculture and the Indiana Experiment Station. By an organized cooperative effort, the soybean processors and the Ohio Extension Service made a large quantity of good seed of Richland easily available to growers in northern Ohio. In two years the acreage of Richland went from a negligible amount to 30 percent of the state total according to the 1943 survey. Now Earlyana too is finding a place in northern Ohio. Early maturing varieties

(Continued on page 53)

ADJUSTING *the* COMBINE

To save more and crack fewer soybeans

By E. L. BARGER

Agricultural Engineering Department
Iowa State College

(Top) Checking combine performance with simple plywood tray. When placed under rear of machine beans under the tray represent shatter and cutter bar losses. Unthreshed pods on top of tray are cylinder losses, and threshed beans on tray are separating losses. (Bottom) The operator must visualize the functioning of parts and adjustments inside his combine to properly understand his machine. This special combine for instruction and demonstration purposes has transparent plastic sides.

THE COMBINE is the best machine we have for harvesting soybeans from the standpoint of labor required, cost of the operation and beans saved. It is good but not perfect. This article concerns the last point; or the adjustment of the combine to save the beans. The various losses and their causes are given in outline form in the chart printed herewith. The remarks that follow explain in greater detail some of the problems the farmer faces in harvesting his soybean crop with a combine.

There are five sources of losses of beans with the combine. They are (1) shatter losses; (2) cutter bar losses; (3) cylinder losses; (4) separating losses; and (5) cleaning losses. If conditions are favorable the percentage of crop loss with the combine is remarkably low. Losses of 1 percent or less are not uncommon. On the other hand all too frequently conditions are such that one or more of the losses will be high enough to be considerable.

BEANS ON THE GROUND

Shattered beans on the ground cannot be recovered by the combine. Shatter losses are best controlled by harvesting at the proper time. This loss may vary from nothing to a major part of the crop. Generally it is less than 1 percent.

The cutter bar loss frequently constitutes the greatest loss in harvesting soybeans and it is the most difficult to control. It may run as high as 20 percent or under favorable conditions be less than 1 percent. A 5 percent cutter bar loss is not unusual. Low hanging pods are common on the varieties of beans we are growing today. It is impossible to operate the machines low enough to get the low hanging pods without running the cutter bar into the dirt. The ridging of beans when cultivating them in rows permits lodged beans to fall into the furrows between the rows and the cutter bar passes over them. *Less ridging will make possible a better job of combining, and varieties with higher setting pods would do much to reduce this loss.* Let us hope the plant breeder will give us such a soybean in the not too distant future.

Cylinder losses come under two headings. First, unthreshed pods in the straw, and second, damage caused by cracking the beans. The first is normally extremely small or a fraction of a percent. The beans cracked can usually be held below 5 percent. The operator can do a great deal toward reducing these losses. To do so requires an understanding of the principles of the combine and its adjustment. The cylinder is the only part of the combine that provides any threshing effect. If a bean is not removed from the pod at the cylinder there is no other part in the machine that will do the job. The removal of the grain from the pod or head is accomplished by so called "threshing effect" and this is determined by the speed of the cylinder, the clearance between the cylinder and the concave or stationary bars and the number of concave bars used.

There are no definite rules that will tell the operator the correct speed, clearance and number of concaves needed. Actually the answer is, "just enough and no more." The instruction manuals with the machines give an approximate range of speed of cylinder that is suitable for the various crops. The proper setting varies widely, however, and after the combine has been set at the approximate speed required, the operator should then study the performance in the field and make corrections as needed.

One should not overlook the fact that the adjustments of the combine in nearly every case constitute a compromise. The threshing effect, for instance, should be great enough that all of the beans are removed from the pod. If the threshing effect is increased, however, beyond this point the percentage of cracked beans will increase. The operator must exercise judgement then as to the best setting. Normally if the threshing effect or the speed of the cylinder and the clearance are set such that practically 100 percent of the beans are removed from the pods he will have a reasonably low percentage of cracked beans.

It is in those cases where an excessive amount of threshing effect, or over threshing is done that the percentage of cracked beans is high. In most cases where 10 to 20 percent of the beans are cracked the threshing effect is entirely too great. The operator has overdone one part of the job at a sacrifice of another. The straw at the rear of the machine and the beans in the tank are the indicators. If the beans are all removed from the pods upon investigating the straw but cracked beans are coming over, it is quite likely that the threshing effect is too great. The actual speed of the cylinder means little. Under some conditions the cylinder can be slowed down even below the recommended speed if the beans are being removed from the pods. In those cases where the beans are hard to thresh out of the pod a compromise is necessary between a reasonable amount of cracked beans and a reasonable percentage of the crop saved.

Separating losses can be high, but if reasonably proper adjustments are made they are quite small and should be less than 1 percent. Separating losses are the ones most easily seen, however, since they constitute threshed beans lost behind the machine and they look bad on the ground. One should not be overly impressed, by a few beans lost behind the machine. It is the overall efficiency with which we are concerned and a person may be unduly concerned over a few beans riding over the rack when as a matter of fact he may have far greater losses occuring elsewhere that are not so visible. Separating losses may be divided into rack losses and sieve losses. Losses at the rack occur when threshed beans ride over with the straw and fall out the rear. This may be caused by operating the rack too slow to give the necessary agitation to the straw, but it is more commonly caused by overloading the rack with straw or weeds and bunching of the straw in the machine.

Sieve losses are effected by a combination of sieve adjustments and wind blast or fan adjustment. Here again over threshing at the cylinder, or too much threshing effect causes trouble, because if the straw is overly threshed it will be broken up causing an abnormal amount of chaff which overloads the chaffer and cleaning sieve. What constitutes a proper setting? As the beans move back over the cleaning sieve they are supposed to fall through.

SIEVE OPENINGS

If the sieve openings are not opened enough beans will ride over the sieve and fall into the tailings conveyor and return to the cylinder. This is undesirable because the likelihood of cracking the beans when they are returned to the cylinder is very great. On the other hand if the sieves are opened too much the beans fall through readily enough but foreign material also will fall through and the job of cleaning will be inferior. Theoretically the correct setting of a sieve would be one that would just permit the last bean to fall through at the last opening at the rear of the sieve. This of course is not practical, so as a rule a setting is used where a few of the threshed beans will pass over the sieve and return with the tailings. The tailings should be made up of only unthreshed pods or partially threshed pods that have been separated from the straw on the straw rack and fallen down onto the cleaning sieves.

A wind blast should be used that gives good cleaning performance. This again is a cut and try adjustment. Excessive wind will blow grain over, and insufficient wind will give a dirty job of cleaning. Here again a compromise enters the picture and a case of where just enough is just right.

SOYBEAN COMBINING PROBLEMS

(Sources of Losses and Causes)

SHATTER LOSSES: (Shattered beans on ground)

1. Harvesting at correct time important

CUTTER BAR LOSSES: (Beans missed or shattered by machine)

1. Cutter bar too high
2. Rows ridged up too much
3. Reel not set to throw cut grain back on canvas
4. Reel set too high to pick up lodged beans
5. Reel slats too narrow

CYLINDER LOSSES:

I. Unthreshed pods on straw
   1. Beans too damp
   2. Cylinder speed too slow
   3. Cylinder-concave clearance too great
   4. Not enough concaves
   5. Concave or cylinder bars bent out of alignment

II. Cracked beans
   1. Cylinder speed too high
   2. Cylinder-concave clearance too small
   3. Too many concave bars
   4. Cylinder not parallel with concave
   5. Too many threshed beans returning with tailings

SEPARATING LOSSES: (Threshed beans lost behind machine)

I. Lost over racks
   1. Rack speed too high or too low
   2. Overloaded with straw or weeds
   3. Overthreshing at cylinder—straw broken too much
   4. Straw bunched up on rack

II. Lost over sieves
   1. Overthreshing at cylinder—too much chaff
   2. Sieves closed too much
   3. Too much wind
   4. Sieve openings clogged
   5. Wind blast not properly directed

POOR CLEANING:

1. Sieve openings too wide
2. Overthreshing at cylinder—straw broken badly
3. Not enough wind
4. Overloaded—beans or weeds
5. Wind blast not directed properly

Contouring helps to lessen soil erosion in this soybean field in Crawford County, Iowa.

SOIL CONSERVATION in Soybean Production

By R. E. UHLAND, U.S.D.A. Soil Conservation Service

SUCH soil conservation practices as contour planting and solid drilling instead of row planting hold promise of safe and profitable production for the soybean grower.

Experiment station findings and farmer experiences agree, too, that raising this crop without unreasonable erosion damage to the land can be accomplished by observing such simple rules as growing the soybeans after sod or other soil-conserving crops instead of after corn or soybeans themselves. Terracing, stubble-mulching and other soil and water saving practices likewise may be important.

Much has been said and written about the erosion hazards of growing soybeans on sloping land. Investigations, however, show that soybeans are conducive to erosion only when they follow a crop whose excessive tillage has caused the destruction of the grandular soil structure.

Soybeans after sod were not especially conducive to erosion. But when they followed corn or a crop of soybeans or other clean-tilled crops they were subject to erosion.

Obviously, when soybeans are grown on sloping land they should not be used in addition to corn but in place of corn in a soil-conserving rotation. Other soil-conserving practices also should be used, including the utilization of crop residues, application of soil amendments, and supporting practices such as terraces and contour tillage needed for controlling erosion and maintaining soil fertility.

Soybeans were almost unknown in most sections of the United States less than 40 years ago. In 1907 there were but 50,000 acres of soybeans grown in the entire country, but by 1938 the acreage had increased to 7,262,000 acres. For the past three war years, the acreage has been around 14 million acres, more than 10 million acres of which have been harvested for beans. Because of the war and the need for a greater production of vegetable fats and oils in the United States the acreage of soybeans is continuing to expand, as indicated above. The listed acreages are exclusive of interplanted acres which in 1940 amounted to almost 1 million acres, when only one-half of the interplanted acres were counted.

Reports from many sections of the Cornbelt, where more than three-fourths of the soybeans are grown, indicate that the acreage this year may equal that of past years. Excessive rains have delayed corn planting and caused a large acreage to be planted to beans.

The Missouri Agricultural Experiment Station reported in *Missouri Bulletin 366* that the erosion losses from land planted to soybeans in 42-inch rows at Columbia were 95 percent as great as the losses from continuous corn. The slope of this land was a little under 4 percent. Where soybeans were drilled annually in 8-inch rows, the soil loss by erosion was but 44 percent as great as from land in corn

• With the war over sound conservation practices become of utmost importance. We believe the author will start an argument with his plea for solid drilling of soys. Photos are from the Soil Conservation Service.

year after year. This study covered the period 1924 to 1931, and in both cases the soybeans were followed with a rye cover while the corn land remained bare.

Cooperative studies by the Soil Conservation Service and the Missouri State Experiment Station at Bethany show that land in soybeans grown in 42-inch cultivated rows lost soil at the rate of 33.3 tons per acre, as compared to a loss of but 17.5 tons when drilled in 8-inch rows. For 1936, rowed and cultivated beans lost 31 tons of soil to the acre, while those drilled solid lost only 17 tons an acre. The slope of this land was about 8 percent.

The effect of the cultivated soybeans continued into the next year, when still greater soil losses occurred. For example, the soil loss from oats in 1937 following cultivated soybeans was 15.2 tons an acre, while that from wheat after soybeans drilled in 8-inch rows was less than 1 ton to the acre. Sixty percent of the loss of soil from the oat land occurred in early April soon after the oats were seeded.

EROSION LOSSES

Erosion losses from terraced land at Bethany where soybeans were grown in a 4-year rotation of corn, soybeans, wheat, clover and timothy showed for a 9-year period the average annual per acre loss from contoured soybeans and corn was 3.6 tons for each, while for oats it was 1.2 tons, and for clover and timothy the loss was but .7 tons.

Though the average soil loss from contoured corn and soybeans for this 9-year period was identical, attention is called to the fact that corn followed clover and timothy-meadow each year. The erosion loss for the first year corn after sod is usually only about one-half as great as that from land in second-year corn. Also, the corn land remained bare until the soybeans were planted in May, and the soil loss that occurred from January until May was charged against the soybeans.

Results of more recent soil conservation on this important crop are reported by D. D. Smith in *Missouri Agricultural Experiment Station Bulletin 469*. Here, the soybeans were harvested for hay, but the soil loss from a rotation of barley-meadow-soybeans, in which the beans followed the meadow crop, averaged only 1.86 tons an acre per year, compared with 5.68 tons an acre from an annual rotation of barley-soybeans, and 8.51 tons an acre annually from a 4-year rotation of wheat and lespedeza-lespedeza-corn-soybeans.

Studies made by C. A. Van Dorn at Urbana, Ill., showed that soybeans harvested for hay were more susceptible to water losses and erosion than similar areas where soybeans had been combined. At the end of a 20-minute rain in the fall of 1942, during which .68 inch of water fell, the plot harvested for grain with the residues returned was losing runoff water at the rate of 41 percent. The same rain caused a runoff of 75 percent on land where the soybeans had been harvested for hay.

Because soybeans generally have been grown after land in a clean-tilled crop, the soil condition in consequence of two or more tilled crops in sequence has contributed materially to the general belief that soybeans are one of the most erosion-conducing crops. Where the beans follow sod crops in the rotation they cannot be classified as particularly conducive to erosion, thus suggesting that the soil condition, rather than the crop, is the factor of concern.

Observations of the writer and reports of others indicate that more beans are being grown in rows than before. J. C. Hackleman reported in the June issue of the *Soybean Digest* that 54 percent of the 1944 soybean crop in Illinois was row planted, compared with 25.8 percent in 1940. He states, also, that the rowed beans for one year, 1940, grown by cooperators yielded 2.9 more bushels to the acre than drilled beans. The control of weeds is given as one of the major advantages of row planting.

A common sight in corn and soybean fields where soil conservation farming is not practiced. An estimated 200 tons of soil an acre was washed from this field in 1944.

Obviously, from an erosion standpoint it is highly objectionable to increase the acreage of rowed beans as the soil losses are about double those from drilled beans. The weed problem can be met equally well where the soybeans follow a sod crop in place of continuous soybeans or another clean-tilled crop. After the war, there likely will be less pressure for large acreages of clean-tilled crops, thus permitting better crop rotations and correspondingly better soil conservation.

ROTATION IMPORTANT

The greatest erosion and runoff in the Cornbelt usually occurs in the spring around planting time, again in late fall, and early the next spring. During the period when soybeans are growing most rapidly, however, they actually protect the land against both runoff and erosion. For example, on August 13, 1940, at Bethany, Mo., when the soybeans were about knee-high, 2½ inches of rain fell in but 30 minutes. The runoff in the catchment tanks was so clear that sampling for soil was not necessary. Had a rain of this intensity come in early spring, the soil loss from newly seeded soybeans or soybean-stubble land would have been extremely large. This experience emphasizes the importance of using a good rotation, leaving a considerable amount of residue on the surface, contouring both row and drilled beans and, where possible, using terraces so that needed protection will be supplied at all times.

Earlier findings covering tests extending over several years in Illinois, Ohio and Indiana show that higher yields of both grain and hay were obtained when soybeans were drilled solid than when they were planted in rows and cultivated. *Illinois Bulletin 428* reports an average yield of 23.2 bushels of soybeans an acre when the crop was drilled, and 17.8 bushels per acre when planted in rows and cultivated. It states that in 1935 about 85 percent of the beans grown in the large bean producing section of central Illinois were drilled solid. *Indiana Circular 242*, revised in May 1941, shows that for an 11-year period larger yields of both grain and hay resulted when the beans were drilled solid.

Short-time tests reported in *Ohio Bulletin 384 and Illinois Bulletin 462* for comparing grain yields for soybeans drilled solid and soybeans planted in 24-inch rows showed a slight advantage in favor of the 24-inch rows. It is pointed out, however, in the Illinois bulletin that yield is not the only consideration, but that relative growing costs, competition with other crops (mainly corn) for labor and equipment, and relative control of weeds also must be taken into consideration. Grow-

ing costs usually are higher when the beans are planted in rows far enough apart to be cultivated two or three times with a row cultivator. Coming at the same season, these cultivations are likely to compete with corn for labor and equipment; therefore there is an added advantage to drilling the soybeans.

Research findings show that by increasing the acreage of rowed beans the erosion losses will be increased markedly on sloping land. They also show that the removal of surface soil by erosion sharply lowered the yield of beans. For the Shelby soil, the loss of each inch of surface soil lowered the per acre yield from 1.2 bushels to 2.4 bushels. These losses can be reduced materially by using terraces, with contour tillage as necessary supporting soil conservation practices for soybean rotations.

FERTILIZER LESSENS LOSSES

The use of lime and fertilizer in the rotation will boost the bean yield further and greatly lessen the erosion losses. Soybeans draw heavily on the mineral supply in the soil. Based upon chemical analyses, a 30-bushel crop of soybeans removes from the soil almost as much phosphorus, twice as much potash and five times as much lime as does an 80-bushel corn crop.

Contour tillage for the 5-year period 1939-1943 in Illinois increased the yield of soybeans 2.7 bushels over those planted up-and-down the slope. In Missouri, records for 1942 show yield increases of 12 to 15 percent where contouring was practiced. For Iowa, the increase was 3.2 bushels in 1942 and 2.2 bushels in 1943.

Results at the Bethany Soil Conservation Station show that contour cultivation in preparing land for small grain and for producing corn over a 7-year period reduced the water loss an average of 20 percent, and the soil loss by 52 percent. Equally as marked reductions in soil and water losses may be expected from practicing this type of cultivation in producing soybeans and by growing soybeans in place of corn, rather than in addition to corn.

Farmers will be well advised to give careful consideration to these soil conservation measures in postwar production of this important crop so that they can continue to produce satisfactory yields of soybeans, as well as other crops, without undue injury to their basic asset—the soil.

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Scientists in the research laboratories of the United States Rubber Company have developed a new fabric made principally from chicken feathers which is designed for use in suits, dresses, sweaters and other wearing apparel of the future.

SOYBEANS IN ROTATION

By F. C. BAUER

Prof., Soil Fertility, Dept. of Agronomy
University of Illinois

FARMERS differ much in the use they make of soybeans in their cropping systems. Many have such enthusiasm for the crop that they give it first place in their acreage allotments. In some Cornbelt counties more land is devoted to soybeans than to corn. On the other hand, some farmers are very cautious with the crop, even to the extent of excluding it entirely from their cropping systems. The usual reason given is that soybeans are "too hard" on the land. These differences in attitude toward this valuable crop, raise two questions: (1) Is it possible to over-emphasize soybean production on our farm lands, and (2) can soybeans be produced satisfactorily, with no more wear and tear on the land than is likely to result from growing other common field crops? Broadly speaking, the answer to both questions is yes, and the manner of smoothing out the problems is about the same as for other crops, namely, using well-balanced crop rotations and giving proper attention to soil fertility and conservation practices. Our purpose here is to consider some of the rotation aspects of these problems.

Well-balanced crop rotations, under Cornbelt conditions, should, in general, be planned on the basis of the following considerations:

(1) The use of crops from each of the following three classifications: (a) Cultivated row crops; (b) close growing small grain crops; and (c) deep-rooted legumes and other sod-forming crops. The acreage devoted to the legumes and sod-forming crops should be expanded at the expense of the row crops on soils of increasing slope and declining fertility. With lessening slope and increasing fertility the row crops may be expanded, but this should not be done with too much reduction in the legume and sod-forming crops. In general the latter crops should occupy the land about one year in four.

(2) The use of crop sequences that tend to favor the beneficial effects of the various crops on the soil, on each other and to reduce the harmful effects of insect pests, crop diseases and weeds.

(3) The opportunity to use crop handling practices that will return sufficient legume residues to the soil to supply all or much of the nitrogen required by the non-legume crops and sufficient non-legume residues (straw and stover) to obtain the maximum benefit from the legume residues.

An appraisal of soybeans on the basis of these specifications for well-balanced crop rotations, brings out the following points:

(1) Although the soybean is a legume, it cannot be classified as a deep rooted legume or a sod-forming crop. It seems to fit the cultivated row crop classification better.

(2) The place of the soybean in the rotation should be determined on the basis of one or more of the following and perhaps other considerations:

(a) As a legume, the soybean can take care of its own nitrogen requirements, if properly inoculated. It should, therefore, not follow another legume.

(b) Unless the whole crop is plowed under, soybeans contribute but little, if any nitrogen to the soil. Soybeans should not therefore, precede a crop like corn, that has need for a plentiful supply of nitrogen.

(c) Soybeans possess a high phosphorus and potassium requirement. Crops following soybeans should be insured an adequate supply of these nutrient elements by means of a suitable fertilizer program. Failure to do this is one reason for the poor stands

• *F. C. Bauer, chief of the soil experiment fields and professor of soil fertility at the University of Illinois, has been a member of the Department of Agronomy staff of the University since 1911.*

of legumes frequently obtained in small grain crops following soybeans.

(d) Soybeans have a tendency to increase soil tilth. This increases erosiveness on sloping lands and makes it more difficult on some soils to produce crops following soybeans that require firm seed beds. When small grain crops follow soybeans, the tilth problem should not be intensified by excessive seedbed preparation, a factor that may also contribute to less successful stands of legumes seeded in small grain crops.

(e) In some sections, soybean fields harbor the grape colaspis, an insect, the larvae of which feed upon the young roots of some crops the following spring. If corn or soybeans follow a soybean crop they may suffer considerable root damage and hence be unable to properly absorb sufficient nutrients from the soil, especially phosphates, for normal growth and yield. Where such conditions prevail it will be better to follow soybeans with small grain crops. Spring grains fit this requirement well and fall seeded grains may be used where the soybean crop matures in time to make the seedings.

(3) Soybean residues make an excellent source of soil organic matter. They should not be burned or removed from the land.

On the basis of these considerations the soybean can be fitted readily into Corn-belt crop rotations. The rotations can be planned for time periods ranging upward from 3 years. In some sections, there is a tendency to produce corn and soybeans in alternate years, on the same land. From the immediate income and emergency point of view, such a cropping system has temporary value on some soils, but from a long-time point of view, it violates several principles set forth above and hence cannot be regarded as a well-balanced cropping system. As an example of rotations that fit these principles fairly well, the following may be suggested.

Although these rotations satisfy the general requirements for well-balanced rotations, a study of them reveals that some are less desirable than others. Those depending wholly on green manure legumes for nitrogen replenishment are not likely to prove as satisfactory over long-time periods as those that include some use of the deep-rooted legumes as a regular crop. The shorter rotations do not provide as good crop balances as the longer rotations. Long rotations may become somewhat complicated. In general rotations in which deep-rooted legumes serve both as regular and green manure crops are more desirable. In the above examples only the longer rotations permit this. It is possible, however, by using a perennial legume, like alfalfa, to design four-field rotations that provide this feature. Any of the above four-field rotations, (4,5,6,7,-8,9) as well as others, can be fitted into such a plan. Using rotations No. 4 as an illustration of such a design we have the following:

MODIFIED DOUBLE FOUR-FIELD ROTATION: CORN, SOYBEANS, OATS, ALFALFA

Field	Years							
	1	2	3	4	5	6	7	8
I.	C	Sb	O(Le)	C	Sb	O	Alf	Alf
II.	Sb	O	Alf	Alf	C	Sb	O(Le)	C
III.	O(Le)	C	Sb	O	Alf	Alf	C	Sb
IV.	Alf	Alf	C	Sb	O(Le)	C	Sb	O

This type of crop rotation possesses a number of advantages. The four-field rotation, in which three fields are devoted to cash and feed grains and one to a deep-rooted perennial legume, is in evidence each year, but it will take eight years to complete the cycle. The special feature of this plan lies in bringing the alfalfa crops in two successive rotations together into one two-year period. This permits the alfalfa to function more effectively, eliminates one seeding and provides, in addition, for the use of sweet clover as a green manure at a favorable place in the rotation. Soil improving and conserving legumes occupy the land as follows: 25 percent each year and 50 percent in alternate years, which is equivalent to 37½ percent annually. The legumes come at times in the rotation when the nitrogen levels are low. The corn crops follow deep-rooted, nitrogen-supplying legumes. The alternate seeding of alfalfa and sweet clover favors seed cost economy. Any perennial sod-forming crop, self-seeding annual legumes, non-legume grasses or mixtures of these with biennial and perennial legumes may be used in place of the alfalfa. These rotations may be designed to fit various situations, such as differences in soil productivity, erosiveness, type of farming, the production of new crops, changing crop prices and hazards of weather, insects and diseases, without sacrificing the essential features of the plan. Flexibility for meeting these problems is provided for in the choice of crops and split cropping on one or more fields.

Rotations of this character, in which the crops are adjusted to soil conditions and supported by a proper soil fertility and conservation program, will favor the production of soybeans. When grown in this way, the soybean crop is not likely to produce any more wear and tear on the land than would result from growing any other common cash and feed grain crop.

SOYBEAN ROTATIONS

No.	Fields or Year Required					
	1	2	3	4	5	6
1	c	Sb	O (Le)	—	—	—
2	c	Sb	W (Le)	—	—	—
3	c	Sb	O (Le)	W (Le)	—	—
4	c	Sb	O	Leg	—	—
5	c	Sb	W	Leg	—	—
6	c	C/Sb	O	Leg	—	—
7	c	Sb/O	W	Leg	—	—
8	c	Sb	O/W	Leg	—	—
9	c	C/Sb	O/W	Leg	—	—
10	c	C	Sb	O	Leg	—
11	c	Sb	O (Le)	W	Leg	—
12	c	C	Sb	O (Le)	W	Leg

c—Corn; Sb—Soybeans; O—Spring Oats; W—Winter Wheat; Leg—Deep-rooted Legumes; (Le)—Green Manure Legumes; /—Split Field Cropping.

JOHNSON

(Continued from page 20)

incur the wrath of every livestock lover in the nation.

Plastic, glues, synthetic rubber—these products represent another very difficult group of compounds as these would replace wood, natural rubber, steel and other metals. The possibilities are there. But can soybean products be produced at a competitive cost?

Constant improvement takes place in equipment and methods for removing the oil from soybeans as well as in the preparation of final products. These costs are already very low, so low that even a 50 percent saving would make only a few cents per bushel change in the price of soybeans. War time stimulation has expanded the soybean crushing industry beyond a probably stable soybean production.

This is some of the evidence. Much more could be added and some of the above expanded. Each of you may add your bit to the above and answer the major question. As you weigh each particle of evidence you will gradually become more and more thankful that the American Soybean Association is on hand to constantly watch and direct these new developments and keep you advised through the *Soybean Digest*. From the processors I bring you a sincere request that you always remember that we only exist because you soybean growers made our existence necessary.

Soybean plots at Ewing Soil Experiment Field in Franklin County, Ill., demonstrate that mineral fertilizers supplying only phosphorus and potassium are of little value on gray flat prairie soils without limestone. Limestone was not applied on plot shown in upper picture.

Soybeans Need Lime, Phosphorus, Potash

By A. L. LANG

Assoc. Chief, Soil Experiment Fields, Dept. of Agronomy, University of Illinois

• *Soybeans follow corn like the hog the steer. If the corn crop is well fed soybeans need little or no fertilizer, says the author, who has been working on soil fertility problems at the University of Illinois for 24 years.*

LIMESTONE is the number one requirement of soybeans on acid soil. Even though soybeans are well adapted to a wide variety of soil conditions and perform better than most cereals on acid soils, still they are sensitive to mineral deficiencies and respond well to properly used soil amendments

In 1944 the 71 million bushels of soybeans harvested in Illinois took from the soil almost twice as much calcium as the 400 million bushel corn crop. At the same time they removed more potassium and one-half as much phosphorus as the corn. The 71 million bushels of soybeans removed from the soil 120 million pounds of calcium, phosphorus, and potassium, while 400 million bushels of corn removed only 20 million pounds more or 140 million pounds of the same elements. In terms of liming and fertilizing materials the 1944 Illinois bean and corn crop removed from the soil calcium, phosphorus and potassium equivalent to 20,000 tons of limestone, 320,000 tons of rock phosphate and 200,000 tons of potassium chloride. Even at the present time when more fertilizing materials are being used than ever before in the history of the country landowners and operators are falling far short of returning to the soil the plant food removed by the corn and soybeans alone.

No wonder thinking people are concerned.

But let's blame the culture, not the crop.

The high mineral requirement of the soybean plant and its inherent ability to forage its nutrients beyond the range and scope of other crops tend to give it an undeserved bad reputation for being a soil robber or depleter. But, as a matter of fact, when truly evaluated, *that inherent ability of the soybean plant to ferret out plant nutrients that other crops cannot reach makes it surprisingly suited to the Cornbelt cropping system.* The soybean follows the corn crop as effectively and in the same manner as the porker follows the steer in the feed lot. If the steers are well fed the hogs need very little attention. Likewise, the soybean—if the corn crop is well fed the bean crop will need little or no fertilization.

The problem, then, of returning plant food removed from the soil by the soybean crop becomes not one of direct application applied for the plant itself, but rather a matter of determining the needs of the entire cropping system and making the applications to those crops which can use them most effectively.

In analyzing the needs of a typical Cornbelt rotation including corn, soybeans, small grain and legume hay for a heavily cropped level to rolling prairie soil many factors need to be considered. The key to high productivity on such a soil when measured in bushels of corn and soybeans is the amount of legumes that can be plowed down preceding the growing of the corn crop. The legume supplies the large quantity of nitrogen without which the corn crop cannot make maximum yields. In addition, the legume supplies organic matter which in turn gives tilth, aeration and water-holding capacity to the soil, all of which are as vital as minerals supplied through fertilization. The amount of a legume which can be grown is largely determined by the nutrient-supplying power of the soil and so the first efforts to soil improvement should be directed to and for the legume hay pasture or manuring crop. *When sufficient limestone, phosphate and potash is applied to meet the maximum requirements of the legume forage crop in the rotation grain crops like corn and soybeans will be amply cared for, providing enough of the forage crop is returned to the land in either green or animal manures.*

For the average Cornbelt soil this means 2 to 4 tons of ground limestone every 8 to 10 years; for most soils it also means 1,000 to 1,500 pounds of finely ground rock phosphate every 8 to 12 years or its equivalent in superphosphate, 500 to 800 pounds an acre each rotation. Where potassium is shown to be deficient by test, then 200 to 400 pounds of potassium chloride per rotation will do the job either all applied for the clover or divided between the clover and grain crops.

This outlined fertilizer program for soybeans has been proved to be effective by more than 30 years of results from the many permanently established outlying soil experiment fields in Illinois. It is simply and easily put into practice by owner and tenant operators alike.

Do Soybeans Contribute to CLOVER FAILURE?

By O. H. SEARS

Chief in Soil Biology
Illinois Agricultural Experiment Station
Urbana, Illinois

• *The author gives some reasons why clover sometimes fails following soys and some steps for remedying such failure.*

NOW that an increasing number of farmers are plowing under their corn stalks in order to minimize damage from the corn borer they plant soybeans after the corn. Clovers are then seeded in the small grain which follows the soybean crop. Some farmers have found that their clover fails frequently in such a sequence; however, others have had their best clover stands after soybeans.

Although more information is needed before the reasons for the occasional failures can be evaluated accurately, it is apparent that their causes are not the same in all cases.

EFFECT OF SOIL ACIDITY

In some instances soil acidity is responsible for the lack of success with clover. Recently, soil tests showed that a certain field required 4 tons of limestone an acre for good clover growth. Previous to the tests the person who submitted the samples attributed the clover failure to the soybeans which preceded the clover. A lack of available phosphorus or potassium, or both, may be responsible for failures in other cases.

Experiments conducted during the last 10 years indicate that, in some seasons at least, too much seedbed preparation for the small grain in which the clover is seeded may contribute to clover failure. In 2 years at the Urbana south farm red clover seeded in wheat failed completely where soybean land was plowed before seeding the wheat. A good stand of clover was secured in wheat which was drilled without seedbed preparation. In 1945, however, good stands of clover were secured in both wheat and oats, regardless of the seedbed preparation. Obviously, weather conditions are responsible, in part at least, for these apparently inconsistant results.

It has been shown previously that the supply of available soil nitrogen is higher following soybeans than after corn. As a result, small grains following soybeans, particularly oats, grow more rank than after corn. Thus they compete with the clover for moisture and plant-food elements as well as shade it. This fact is easily demonstrated in oat fields where soybean straw is bunched by the combine.

An accumulation of nitrate nitrogen also limits nodule formation as well as root development; consequently, dry weather following small grain harvest may affect the clover stands unfavorably. Plowing the soybean stubble land or thorough disking tends to incorporate the soybean straw in the soil and increase the supply of available nitrogen.

It is recognized generally that soybeans leave the soil "loose" and friable--perhaps too "loose" in some instances for the best kind of seedbed for clovers. *Cultivation may make the soil even "looser".* To what extent a loose seedbed is responsible for clover failures is not yet clear.

As indicated previously, clover stands were highly satisfactory at Urbana in 1945. This season has been one of unusually heavy rainfall and of relatively low temperatures in this part of Illinois, conditions which are not favorable for the production of nitrate nitrogen. The heavy rainfall has had a tendency to compact the soil also. Consequently, if nitrate nitrogen accumulation and/or a loose seedbed affect the stand of clover unfavorably, it is easy to understand why the clover has done so well this year.

O. H. SEARS

With the older type combines it was possible to drill wheat directly behind the combine without any seedbed preparation. The development of a straw chopper on the newer combines makes it possible to drill both winter and spring grains on soybean stubble land without disking to cut up the straw left on the ground. There is reason to believe that improved stands of clover secured by this practice will increase its popularity.

The failure of clover seedings after soybeans, as well as after other crops, has been traced directly to poor methods of seeding. A few still sow their oats and clover together, disking both into the soil. A good way to seed clover is to use a grain drill with a grass-seed attachment. If a drill is not available the seed can be broadcast and then covered by using a corrugated roller.

By making sure that the soil is not deficient in lime, available phosphate and potash; by seeding the small-grain companion crop with as little seedbed preparation as possible: and by covering inoculated clovers lightly the stands of clover after soybeans can be improved.

—s b d—

YIELD INCREASED BY LEVEL FARMING

Level farming increased crop yields on sloping land from 9 percent to 15 percent in 1944, according to a summary of 1942 farm account records in 40 Illinois counties.

The farm account records showed average yield increases of 4.9 bushels of corn or 9 percent, 2.7 bushels of soybeans or 13 percent, 4.7 bushels of oats or 13 percent, and 3.1 bushels of wheat or 15 percent from contour farming, strip cropping, contour farming with terraces and buffer strips and the use of grass waterways compared with up-and-down hill farming on the same farms.

That the 1944 results were not just a "flash in the pan" is evidenced by the fact that for the 6 years, 1939-44, Illinois farm account records showed the following average yield increases for crops planted on the contour compared to off the contour on the same farms: corn, 7 bushels; soybeans, 2.7 bushels; oats, 6.9 bushels; and wheat, 3.4 bushels. The increased production from conservation practices or "around-the-hill" farming for these account keepers was equivalent to their having 12 percent more land in corn, 13 percent more in soybeans, and 18 percent more in oats and wheat.

SOYS IN FOOD...

FUTURE OF VEGETABLE VARIETIES

By W. J. MORSE

Principal Agronomist, Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, USDA.

• *The present and future of soy foods from several standpoints is discussed in the following pages. The vegetable varieties offer substantial possibilities in the opinion of Dr. Morse.*

THE REAL problem with respect to the postwar food of the world population is said to be the marshalling of the agricultural resources of the world and the proper distribution of foods based on human needs. The importance of legumes as an economical source of protein for human food has become quite generally recognized during the past few years and more consideration is being given to the nutritional values of plant proteins that may serve in the diet. The soybean, in view of its richness in digestible nutrients as indicated partly by its unusually high percentages of protein and oil, deserves high rank as a food crop. The comparatively low cost of soybean products makes them an ideal source of protein of high nutritive value in making up deficiencies. This is an important point in relation to postwar foods, not only for our own country but also for the people to be fed abroad.

As a dried vegetable bean, the soybean has not been used very extensively in this country although large quantities of food products are being manufactured in whole or in part from it. One of the chief factors in the retarded progress in the use of the soybean for food in this country has been the lack of varieties suitable for food purposes, although prejudice and food habits have been contributing factors. During World War I, efforts to promote the wider use of soybeans for food were unsuccessful because of unsuitable varieties and the poor quality of processed soybean foods. The varieties commonly used for forage and industrial purposes are, in general, difficult to cook and have a rather strong bean flavor and, therefore, are not particularly suitable for food.

ORIENTAL VARIETIES

In oriental countries where the soybean has been used for many centuries in the preparation of a great variety of fresh, fermented, and dried food products, varieties have been developed over a long period of time for special purposes. Some varieties were developed for use as green vegetable beans and others for bean milk, bean curd, bean sprouts, bean flour, and various other food uses.

During the period 1929 to 1931 a large collection of oriental varieties used solely for food purposes was introduced by the United States Department of Agriculture. The term "vegetable" varieties has been applied to these introductions to differentiate them from varieties grown for other purposes. These vegetable varieties, differing widely in size, shape, and color of seed, and ranging in maturity from very early to very late, have been under extensive tests by special cooperators and nearly all experiment stations throughout the United States and our insular possessions. Several foreign countries seeking sources of efficient protein have imported considerable quantities of seed or are conducting extensive trials with the most promising of the vegetable soybean varieties. Results have shown these varieties to be much superior to the field varieties in ease of cooking, flavor, and texture, and that they differ markedly among themselves in these qualities.

Nutritional studies with vegetable varieties of soybeans have shown that they rank higher in food value in both the green vegetable and the mature stages than other beans and peas. Proteins, fats, minerals, and vitamins are the most costly constituents of our diet. The high content and character of the protein and fat of the soybean explain in part its high nutritional value. In both the green and dry forms, the soybean contains much more protein and fat than other legumes but its carbohydrates are lower. It can be relied upon as a good source of the nutritionally important mineral elements, containing more calcium, iron, and phosphorus than any of the cereals and two to three times as much calcium as other peas and beans. The calcium and iron contents of both green and dry soybeans compare very favorably with any list of foods that are

generally considered rich sources of these elements.

At the Hawaiian Experiment Station it was found that cooked green vegetable soybeans had unusually large amounts of protein, fat, calcium, phosphorus, and iron as compared with most other vegetables and were good sources of vitamins A, B, and G. In addition to vitamins A, B, and G, the soybean is said to contain varying amounts of C (green vegetable stage and sprouts), D, E, and K.

Vegetable varieties of soybeans have several potential uses which could be developed through increased production of seed of the most suitable varieties. The two most promising uses at the present time are as green vegetable beans for the home gardens and for the canning and frozen food industries and as dried beans for various food purposes.

MIDSUMMER TO LATE FALL

The vegetable soybean constitutes a new green vegetable analagous to the fresh lima bean and garden pea, but with a flavor of its own which should make it not a substitute for any other vegetable but rather a valuable addition to the foods that the home garden can furnish. As a green vegetable, the soybean has many advantages, being easy to grow and having considerable tolerance to drought and resistance to insect attack. The green beans can be made available from midsummer to late fall when other green vegetables are likely to be scarce, especially in dry seasons.

The commercial canning of green vegetable soybeans has greatly increased during the past few years and the canned product has had a wide distribution. Many consider canned green soybeans as satisfactory or more so than other canned green vegetables; others find their flavor quite unpleasant. Some of the unfavorable comment in connection with the canned product has been due largely, if not entirely, to the use of field varieties, beans too mature, and incorrect processing. There is no reason why an excellent canned product cannot be obtained if suitable vegetable varieties are harvested at the right green stage and properly processed.

In a series of studies at the Illinois Experiment Station to discover the best methods of preserving green vegetable soybeans for winter use, freezing seemed to be the most efficient and effective preservative. The freezing method, if properly handled, retains all the good qualities of the fresh beans. Several frozen-food product companies have experimented successfully with vegetable varieties of soybeans and they may become popular among winter vegetables. Home gardeners having cold storage lockers or home freezing units have been growing and preserv-

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MARGARINE
and the Future of Soybeans

By ALBERTA BROWN

• *As the volume of soy oil going into margarine increases growers become more interested in the margarine market. The author is an attorney with the law firm of Tocker, Todd, Donoho & Dillon, Washington, D. C.*

THOUGH there were only 2,000 acres planted to soybeans in 1909, the total acreage for this crop in 1944 was approximately 14 million. The account of the phenomenal growth of the soybean industry is an impressive chapter in the history of agriculture in this country.

And what about the future of this crop to which more and more farmers have turned? Will production be further increased? Will the market for this profitable product of American farms continue to expand after the war? An optimistic answer, of course, depends upon many things. The purpose here is only to discuss the relationship which exists between the future soybean market and the manufacture and sale of margarine. There is no better proof of the importance of this relationship than the following observations: In 1933 margarine manufacturers were still experimenting with soybeans as a possible source of oil for their product. The amount of soybean oil used in margarine increased from a scant 7,000 pounds in that year to 211,105,000 pounds in 1944. Today, margarine provides the second largest outlet for this nutritious oil. Can margarine, however, continue to use an increasing supply of soybean oil in the postwar era?

COMES FROM U. S. FARMS

Margarine is a product of American farms. Scientists and laymen as well know that margarine is a pure, wholesome food direly needed to supplement the diets of the increasing many who could afford to buy margarine but who cannot afford to buy butter. Yet margarine has been singled out for special treatment by all but four of the states and by the federal government. A mass of laws have been passed for the admitted purpose only of restricting the manufacture and sale of margarine and which in normal times have that result. In fact, in no other country, with the possible exception of Canada, is margarine so legislated against as here. So long as these laws are in effect, margarine cannot provide the market which it otherwise could for soybean oil. Therefore these laws which operate as such an effective barrier to the increased production and consumption of margarine invite the concern of the soybean grower.

FIRST LAW IN 1886

The first federal margarine law, passed in 1886, imposed a tax of 2c a pound. This tax was increased in 1902 to its present rate of 10c a pound, except that margarine free from "artificial coloring" was taxed only 1/4c per pound. This increase, as in the case of the original imposition, was aggressively opposed by Southern and Western congressmen who foresaw its ruinous effect on sales of a commodity that provided a valuable market for animal and vegetable fats and oils. These opponents of the measure urged that the fraudulent sale of margarine as butter—the basis of the claimed need for an increased tax—could be eliminated by more detailed packaging and labeling regulations. They were unsuccessful, however, and notwithstanding repeated subsequent efforts through legislative* and judicial proceedings** to reduce the tax or to eliminate it altogether, the 10c per pound tax on margarine is still assessed.

Manufacturers, wholesalers and retailers of margarine are required by the federal law to secure annual licenses at a cost of $600, $480, $48, respectively.† A manufacturer of margarine is defined by the law to include all persons coloring margarine for consumption by persons other than members of their own families. This means that a proprietor of the public eating place who colors margarine to be served to patrons is a "manufacturer" within the meaning of the law and liable

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*In the last session of Congress three bills, H.R. 2400, S. 1744, and S. 1426 designed to eliminate Federal taxes on margarine were introduced and defeated. In the current session two such bills are pending: S. 195 and H.R. 579.

**McCray v. United States, 195 U.S. 27.

†Wholesalers dealing only in uncolored margarine must pay a $200 license fee, and retailers similarly confining their trade in margarine to the uncolored product are required to pay a $6 fee.

SOY--CHINA'S CINDERELLA

—CNS Photo

A Chinese mother feeds her children soy milk and soy cakes at a food shop where highly nutritious foods are made and sold at cost price.

By JULEAN ARNOLD
Berkeley, Calif.

WHEN the surging masses of humanity poured into Shanghai during the summer of 1937 in frantic efforts to escape Japanese armed forces, the big immediate problem was food. Tens of thousands camped on relatives and tens of thousands were taken care of by provincial guilds and other Chinese institutions. However for immediate emergency needs 220 refugee camps were set up accommodating about a quarter of a million men, women and children. Among the American relief agencies which shared in supplying food was China Child Welfare, Inc., New York. Although this organization had been started 6 or 7 years earlier to aid the children of China to get a better break, yet by the summer of 1937 it had not yet set up an active agency in China. Instead it had wisely selected a committee of Americans at Shanghai to advise of a propitious time and place for inaugurating its program. Up to that time, it had accumulated about $75,000 in contributions, which were held in New York pending plans for work in China.

With tens of thousands of children in the Shanghai refugee camps clamoring for food, our committee radioed New York an urgent appeal for funds to assist in feeding these children. An immediate reply was received contributing $25,000 of China Child Welfare funds. How could we most effectively spend this money? The prime need was milk. Shanghai was one of the very few places in China where there were dairies. However, the total number of cows in these dairies were but a few hundred. Thus there was not much milk available and such as was obtainable was at almost prohibitive prices. Similarly imported canned and powdered milks were relatively very expensive in light of the vast numbers to be fed and the limited amount of funds available. Some one suggested we go to the little soybean for our milk. An international committee had already been working on this problem. It was financed mainly by the German community and carried considerable German personnel.

UNIVERSAL FOOD

Probably the most universally used food product among the 450 millions of Chinese is tou-fu or bean curd. It is a sort of cheese made of the soybean. It is highly nutritious but too concentrated for infants. The shops which made the bean curd also produced a certain amount of soybean milk, apparently a sort of by-product. It was sold very cheaply. However, it was unsafe because its water content was variable and it was deficient in lime, salt and sugar. Fortunately the Peking Union Medical College of the Rockefeller Foundation had several decades earlier carried on extensive research with the soybean under the direction of a Russian scientist Dr. A. A. Horvath. He became a great enthusiast on the nutritive properties of the soybean. He found that by adding a certain amount of calcium lactate, sodium chloride and sugar to the soybean milk, it would be possible to produce a substitute for cow's milk, and at a fraction of the cost of cow's milk. Chinese trained under him carried on research experiments.

Thus when we were interested in preparing a scientific, sanitary and standarized soybean milk we looked for assistance to Doctors Ho and Tso who were trained at the P. U. M. C. but later came to Shanghai to join the Lester Institute where they continued their work on soybean nutritive products. So we impressed them into service. We also secured much aid from Dr. W. S. Fu, who supervised

• The Chinese are finding new uses for the ageold soybean, in relieving the starvation left in the wake of the Jap invasion. The author was engaged in Chinese relief work for a number of years.

a Chinese children's hospital in Shanghai. He gave us accommodations for setting up a small plant for the manufacture of soybean milk in one of the court-yards of his hospital.

This plant consisted of two mill stones about 2 feet in diameter for grinding the beans and a Chinese brick oven accommodating two large iron pans for boiling the milk. An American dairy loaned us a number of 10-gallon cans for transporting the milk to the refugee camps. The upper of the two mill stones carried a round wooden peg or handle for turning the stone by man-power. However, it was not long before we fitted the stones to a one-half horsepower electric motor, which we found could do the work of eight men.

The beans were soaked for about 10 hours, then fed to the mill stones through a small hopper. Water trickled over the beans as they went through the stones. The mash went into a small trough which poured into a cheese cloth bag, through which the milk passed into a small metal tank. It was later transferred to the iron pans over the furnace or oven and boiled for about 20 minutes. After boiling, the solution of calcium lactate, sodium chloride and crude sugar, made according to the prescribed formula, was added.

SOY MILK WAS SERVED HOT

The milk was served hot to the children at the camps. This insured the lime remaining in suspension. To the Chinese palate, innured as it is tou-fu or bean curd, and not accustomed to cow's milk, soybean milk can be made which is not distasteful. I have been told that many Chinese find cow's milk strange to their palates.

After taking the milk from the soybean, there is a residue very rich in protein. We found by adding about 40 percent coarsely ground wheat flour which is also plentiful in China, plus the other ingredients above mentioned, we could make a biscuit which when baked in an oven proved to be very palatable. It represented probably the greatest food value for the cost obtainable. A Chinese department store baked them for us. We distributed millions of them to the refugees camps.

In order that our committee might take the fullest possible advantage of the very able assistance we received from Chinese scientists, doctors and others we organized the China Nutritional Aid Council with Chinese and American members for the express purpose of popularizing a properly prepared soybean milk and other soybean nutritional products. In other words we wished to help the people of China to realize that the soybean could be made to mean to their great masses what the cow means to the rank and file of our people. Economic conditions in China will not permit of the developing of dairying in any large scale manner at least for some decades to come.

But the soybean has been so commonplace in China and the people have been so accustomed to their easy going methods of handling it, that comparatively few Chinese seem to appreciate its vast potentialities. Thus, our China Nutritional Aid Council backed by China Child Welfare, Inc., New York, as represented by its Shanghai committee launched forth upon a campaign to give people in other sections of the country the advantages of our experiences in providing soybean milk for from 25,000 to 37,000 children daily in the refugee camps in addition to several millions of soybean biscuits furnished the refugees.

After about 6 or 8 months the emergency needs in Shanghai eased off. Established institutions and others accustomed to relief work were able to take care of the more needy cases. One of our American missionary hospitals took over a Chinese research bureau and transformed it into an American hospital for refugees. It was under the direction of Dr. J. C. McCracken, a medical missionary of outstanding ability and many years of experience in China. Concerning his experience with soybean milk, Dr. McCracken stated, "I do not know exactly the comparative nutritive values of cow's milk and soybean milk, but I do know that my daughter, who was in charge of the pediatric department and who had a well baby clinic, came to the conclusion that the soybean powdered milk more easily met the needs of the undernourished Chinese child than did the cow's milk powder which she also had there at hand, sent out by the American Red Cross."

Another American medical missionary, Dr. H. W. Miller, went much further in his experiences with soybean milk products. He became so enthusiastic about their possibilities that he set up a modern plant in Shanghai for their manufacture, with facilities for producing qualities acceptable to those whose palates rebelled against the ordinary types of soybean milk.

Our committee in Shanghai was especially fortunate in being able to secure the services of Miss Nellie Lee a Chinese who was graduated from Mt. Holyoke College and who had studied dietetics and social service, She proved to be an admirable administrator. It was she who managed the operation of our soybean milk plant at Dr. Fu's hospital and who supervised the distribution of both the soybean milk and the biscuits. In 1939 she became our field secretary for our China Nutritional Aid Council and spent several years in southwest China with Kun-ming as her headquarters. Later she journeyed on to Chungking, the wartime capital of China.

GOSPEL TO THE MASSES

After Pearl Harbor bombings, our China Nutritional Aid Council moved to Chungking. Dr. Arthur N. Young, financial adviser to the Chinese government, became its head. Miss Lee set up a permanent staff at Chungking with a suitable plant for the making of the soybean milk. She also organized collaborating committees in Chengtu the capital of populous Szechucan Province and in several other centers in West China. Most of her support for this work came through the China Child Welfare Inc., New York. In this latter connection, it may be said that we are deeply indebted to the late Mrs. Owen Roberts, the moving spirit in both the organization and operation of this organization, which later was taken over by the China Aid Council, Inc., New York, also one of the participating agencies of the United China Relief, Inc., New York. Thus, for upwards of 5 years Nellie Lee has been continuously on the job over there in free China spreading the gospel of soybean milk for the great masses in that country. In the main however her work has been essentially relief for she has devoted her principal efforts toward utilizing soybean products in the feeding of refugees, especially infants and children. She recently arrived in the United States hoping to find out what we are doing with the soybean which may be of interest to her in her work and of interest to the Chinese people generally.

When John D. Rockefeller Jr. came to Peking about 25 years ago to dedicate the Peking Union Medical College of the Rockefeller Foundation, he told me that he found it harder to spend money than to make it. American contributions to China, in relief and constructive philanthropy otherwise, during the past hundred years have aggregated several million dollars. I am convinced that had we taken a quarter of this amount and spent it in determining how best we might help the Chinese to help themselves in our aid to them, the remaining three-quarters would have meant many more fold to the gen-

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RESEARCH PROJECTS

on Soy Flour

A Review of Recent and Current Soy Flour Research Projects

A VAST amount of scientific research work on soy flour has been in progress for the past years. These comprehensive studies, carried on by colleges and universities, government institutions and private laboratories, have covered a rather broad field.

Little has been published on the projects for commercial distribution, comments on the findings usually being restricted to technical periodicals. Much of the work still is under way and being directed by the Soya Food Research Council.

The purpose of this article is to review succinctly the major research projects whose implications from a commercial standpoint will be obvious to the buyer and consumer of soy flour, soy grit and soy flakes.

CONTINUED FLAVOR ACCEPTANCE

In order to determine the continued acceptance of bread baked with soy flour, the Soya Food Research Council, 3818 Board of Trade Bldg., Chicago, in cooperation with the Illinois Department of Public Welfare, sponsored a research program at four Illinois state institutions in 1943. Bread formulas containing 4 percent, 5 percent, 6 percent, and 7 precent of soy flour were used over a 90-day period at each of the institutions where tests were run.

The test period was divided into three monthly periods, and accurate records were kept to determine the amounts of bread eaten during each period. A total of 3,787,498 meals were served during the test period with a total of 715,999 pounds of bread and rolls consumed.

The results of this research indicated that there was a continued flavor acceptance of the bread and rolls made with varying amounts of soy flour. In fact a slightly larger amount of bread was consumed during the test period than was indicated by the records kept during the same period of the previous year. This organoleptic research indicated that bread and rolls made with as high as 7 percent soy flour were acceptable. The participants did not tire of the flavor and taste of the bakery products produced.

BREAD BAKING RESEARCH

Since October of 1943 the Soy Flour Association has sponsored a comprehensive bread baking research program at Kansas State College. This project was launched under the supervision of Dr. E. G. Bayfield, head of the Department of Milling Industry at Kansas State College. More than 10,000 loaves of bread have been baked using various levels of soy flour.

In addition many other studies on soy flour and related bakery products now are being made. This research still is in progress. Results already reported have proved helpful to processors who constantly are improving the baking quality of their soy flour products. Current productions of soy flour are being baked regular intervals and the results reflect continued improvement in quality. The results so far obtained from this project have been very encouraging and indicate that soy flour has functional as well as nutritional advantages in bread baking.

GROWTH PROMOTING VALUE

Robert S. Harris, Marie Clark, and Ernest E. Lockhart at the Nutritional Biochemistry Laboratories, Massachusetts Institute of Technology, made a study of the growth promoting value of bread. The formulas used in preparing the bread contained from no milk solids to 6 percent of milk solids and no soy flour to 5 percent of full fat soy flour. The resulting bread products were fed to rats and careful records on growth were obtained.

The results of this work indicate that soy flour supplements the protein of milk solids in a bread formula. Bread with 3 percent milk and 2.3 percent soy flour was superior to bread with 6 percent of milk solids. Bread containing 5 percent of soy flour gave almost identical results with bread containing 6 percent of milk. This completed work was reported March 11, 1944.*

In January 1944, some tests were run at the Midwest Laboratories Co., Columbus, Ohio to determine the effect of 3 percent of soy flour in bread, using formula and conditions similar to those found in actual bake shop practice. Standard patent spring wheat flour and standard patent hard winter wheat flour were used with full fat soy flour, low fat soy flour, and defatted soy flour.

The results indicated that at a 3 percent level, soy flour can be used equally well with hard winter wheat flour as it can with spring wheat flours. The quality of the bread baked using 3 percent soy flour was as good as that of the control loaves. The break and shred, crumb texture and grain of the soy loaves compared favorably with the control loaves although the soy loaves showed somewhat larger volumes.

BLENDS APPROVED

The government's Northern Regional Research Laboratory at Peoria, Ill., recently arranged with the Federal Soft Wheat Laboratory, Wooster, Ohio, for bread baking experiments with blends of wheat flour and several different soy flours. These experiments indicated that the use of additional quantities of potassium bromate overcame volume difficulties experienced where soy flour was used with usual percentages of bromate. Soy-wheat flour mixtures appeared to possess the ability to buffer over-doses of bromate. Soy flour and milk solids, it was found, complement each other very well and produce very satisfactory bread.

SOY IN SWEET GOODS

The Soy Flour Association has contracted with the University of Minnesota to conduct a study on the utilization of soy flour in sweet goods and yeast-raised products other than bread. This research is to be directed toward determining the combination of ingredients and types of soy flour which will give soy flour its maximum value as a functional ingredient in sweet goods consistent with standard quality. It should confirm previous preliminary findings and establish factual evi-

*"Nutritional Value of Bread Containing Soya Flour and Milk Solids," Harris, R. S.; Clark, Marie; and Lockhart, E. E. Reprint from Arch. Biochem., 4, 2, May, 1944.

dence showing the functional advantage of soy flour in sweet goods and yeast raised products.

SOY MACARONI

For a long period of time soy has been used in the macaroni industry. Extensive research was carried out to determine what percentage of soy should be included if Pure Food and Drug Administration were to approve a product to be advertised and labeled as Soy Macaroni. Finally the figure of 12½ percent soy flour was decided upon and this received the formal endorsement of the federal governing body. Macaroni and related products are expected to be large consumers of soy in the years ahead.

SOY MEAT BINDER

Soy flour possesses the qualifications and is accepted as a good binder for meat products. Research conducted in private and government laboratories has established this fact. The acceptance of this research by the meat industry is reflected by the sizeable quantities of soy flour now being utilized by the meat packing industry. In July the United States Bureau of Animal Industries recognized these facts by including soy flour in the list of permitted binders for the manufacture of sausage in federally inspected meat packing plants.

SOY IN CANDIES

The National Confectioners' Association is sponsoring a research program at the U. S. Southern Regional Research Laboratory at New Orleans on the utilization of various high protein agricultural products in candies. More than 100 different tests have been run and although the program has not been completed, soy flour has shown exceptional promise when incorporated into caramels, fudge and nougats. Taste tests have been arranged on all of the products produced as well as tests for keeping quality. Soy flour has substantially improved the nutritive value of the above mentioned candies without influencing the flavor or taste of the finished product. Storage tests to date indicate that the candies containing soy have possessed good keeping qualities.

CONTAMINATION RESEARCH

For the past 2 years the Soy Flour Association has sponsored a research program at the University of Minnesota to determine the susceptibility of soy flour to insect contamination. This work has been run under the direct supervision of Dr. C. E. Mickel of the Entomology Department. Dr. W. A. Riley, director of this department, has also followed the program closely.

The six most common cereal insect pests have been studied under rigid temperature and humidity controls. A program also has been devised to determine the preference which these insects have shown for materials in which they lay their eggs. Although this research has not been completed, preliminary reports indicate that these insects develop much slower in soy products than in cereal products. Mixtures of soy and cereal receive the same preference from the insects studied as do the whole cereal products.

THERMOPHILE STUDIES

In the summer of 1943 the Soy Flour Association decided to sponsor collaborative work on determining the thermophilic content of soy flour. The increased usage of soy flour in canned food products prompted the decision to make an intensive study of this field. Accordingly, a program was sponsored at the University of Illinois under the supervision of Dr. F. M. Clark of the Department of Bacteriology. The laboratories of individual Soy Flour Association members, the National Canners Assocaition, Continental Can Co., and American Can Co., also were active collaborators in this research.

A program was instigated to determine methods of estimating the thermophilic content of soy flour. The heat resistance of thermophiles characteristic of soy products, and the influence of the types of food mixtures on the heat resistance of those thermophiles were included in the program of study. The influence of other food products in mixture with soy flour, on the growth of characteristic soy thermophiles, has been set up for thorough study.

This work still is in progress and considerable improvement has been noted in the latest soy flours submitted for study by our industry. The complexity of this problem has made research slow but definite answers are being obtained to the questions which prompted the study.

KEEPING QUALITIES

While trade records already are available showing the rather admirable keeping qualities of soy, the Soy Flour Association is completing plans for a thorough study not only of the keeping qualities of soy flour itself but of foods containing soy products. The study will deal, among other things, with the keeping qualities under various storage conditions. The several types of soy will be individually examined, as will also the many foodstuffs containing this product.

While keeping quality has not been a problem of serious concern, based on records of the past, the project being launched should provide specific scientific information of substantial value to producers and consumers in the future.

AMINO ACIDS ASSAY

Through arrangements with the Wm. T. Thompson Co. of Los Angeles, the microbiological assay of the amino acid content of soy flour was made for the Soy Flour Association, using Lactobacillus Arabinosus as the test organism. The assay included the determination of tryptophane, glutamic acid, leucine, iso-leucine, valine, cystine, methionine, tryosine, threonine, serine, phenylalanine, and arginine in three different types of soy flour. Outside of a slight deficiency in tryptophane, the protein of soy flour was found to be well supplied with all of the essential amino acids assayed.

EFFECT ON NUTRITIVE VALUE OF BREAD

Frances E. Volz, R. M. Forbes, W. L. Nelson and J. K. Loosli, School of Nutrition, Cornell University, Ithaca, N. Y., ran some growth studies comparing white bread incorporating 5 percent soy flour with white bread from regular bakery production. Their results indicated that bread made with the addition of 5 percent soy flour significantly improved the growth promoting value of white bread which contained 3 percent (the average of 33 samples of breads purchased in 1942 showed 2.30 percent milk solids on a dry basis) of whole milk solids. The biological value of protein of the commercial formula white bread as determined by the Mitchell method was 43.3 as compared with 47.7 for the bread with 5 percent soy flour.**

DIGESTIBILITY AND BIOLOGICAL VALUE

William M. Cahill, Lawrence J. Schroeder and Arthur H. Smith, Department of Physiological Chemistry, Wayne University College of Medicine, Detroit, Mich., ran some studies on adult human subjects to determine the digestibility and biological value of soybean protein in whole soybeans, soy flour and soybean milk. The digestibility and biological value of whole eggs were used as the standard for comparisons in these tests and were given a value of 100. On this basis soy flour was 94 percent digestible and had a biological value of 91.7 percent. Journal of Nutrition, Vol. 28, No. 3, September 1944.

The following reference material will provide additional worthwhile information on soy flour and soy products.

"The Composition and Nutritive Properties of Soybeans and Soybean Oil Meal," a Literature Review prepared by the Soybean Nutritional Research Council, 3818 Board of Trade Building, Chicago, Illinois; 1939.

"Nutritive Value of Soybeans," R. H. Barnes & J. E. Maack. A literature review published by

(Continued on page 44)

**"The Effect of Soy Flour on the Nutritive Value of the Protein of White Bread," Volz, Frances E.; Forbes, R. M.; Nelson, W. L.; and Loosli, J. K., School of Nutrition, University of Cornell. J. Nutrition, 29, 4, pp. 269-275. April 10, 1945.

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RESEARCH DEVELOPMENTS

in Soybeans at the Northern Regional Research Laboratory

By ALLAN K. SMITH and JOHN C. COWAN

Northern Regional Research Laboratory*
Peoria, Illinois

LAST year, Dr. O. E. May, chief of Bureau of Agriculture and Industrial Chemistry, gave you a look into the future of the soybean (*Soybean Digest* 4 (11): 39-40 (September 1944). His article dealt primarily with the industry as a whole, with particular reference to possibilities of future research at the Northern Regional Research Laboratory. While many projects on soybeans are under investigation at the Laboratory, we have chosen this year to report on two projects which we believe will be of special interest to you. This work represents major research contributions on both soybean oil meal and oil.

The first project involves the use of a special soybean oil meal as an extender in resin plywood adhesives. Recent developments in the use of plywood for the exterior construction may be an important factor in expanding the use of soybean oil meal. The second project effects fundamental changes in the fat acid molecules present in soybean oil. These changes greatly increase the chemical reactivity of the oil and its potential usefulness as a drying oil.

EXTENDER FOR PHENOLIC RESIN PLYWOOD GLUE

The introduction of phenolic resin as a plywood glue in this country about 1935, together with the hot-press method of production of plywood, has had a profound influence in expanding the plywood industry. The phenolic resin glue produces a *waterproof* and a *moldproof* bond which is stronger and more durable than the wood on which it is used, and consequently, it has extended the use of plywood to numerous types of exterior construction.

The stable resin glue has made possible during the war period a wide use of plywood for airplane and boat construction and for the building of essential housing units wherever needed. In the postwar period, the use of plywood will be extended to prefabricated structures, such as barns, garages, hog houses, chicken houses, silos, concrete forms, railroad boxcars, homes, and many other important structures. From a study of new plywood uses, it appears that the limits of the expansion will be governed by our reserve forests and their yearly renewable growth rather than by the demand for plywood.

The promising future of plywood means also the consumption of great quantities of phenolic resin glues. It has been stated by reliable sources that the anticipated use of phenolic resin as a glue will exceed its present use in molded plastics.

The research work at the Northern Regional Research Laboratory has shown that soybean oil meal from which the water-soluble non-protein fraction has been removed, or other similar proteinaceous materials, can be used, in amounts up to 40 percent of the total weight of the dry solids in the glue, as an extender for phenolic resin plywood glue without any measurable lowering of the quality of the glue line.

The new glue formulations developed by Glen E. Babcock of this Laboratory are the results of research investigations on both the phenolic resin and the soybean oil meal or other proteinaceous materials. The usual phenolic resin glues do not have sufficient plastic flow to make a satisfactory product when combined with soybean oil meal. However, a successful glue formula was developed by the use of a low-molecular-weight resin and a soybean oil meal from which the water-soluble non-protein fraction had been removed. The proteinaceous material supplied a substantial amount of protein, which functions as a glue and at the same time assists in holding the resin in the glue line.

• *The authors discuss the use of soybean oil meal as an extender in plywood glue and the development of Norconol-S, both potentially important in industry.*

Figure 1 shows test results of specimens of birch plywood prepared with phenolic resin glue extended with soybean oil meal in the ratio of 2:1, after exposure for approximately 750 hours in a Weatherometer. In this testing unit, water is sprayed on the plywood for 5 minutes during each 2-hour period. For the remainder of the time, the plywood is exposed to a strong carbon arc light at a temperature of 50° to 60° C. In this test, it will be observed that the wood failed rather than the glue. The birch test pieces, glued as above, and tested after boiling in water for 3 hours, demonstrated the waterproofness of the glue line since the failure of the test piece is in the wood.

A detailed description of the resin preparation, the glue formulation, and an extended series of test results are being prepared for publication.

Simultaneously with the laboratory investigations, a hardwood-plywood mill has collaborated by making their mill available for commercial trial runs. The initial trials were so successful that the mill is now using soybean oil meal as an extender in all of their phenolic resin glues.

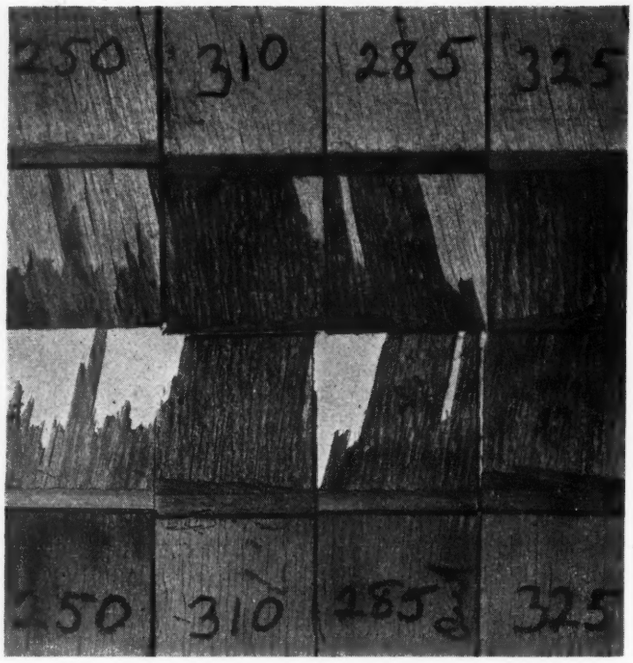
The use of soybean oil meal to extend phenolic resin glues in no way displaces the soybean glues developed in about 1927 by I. F. Laucks, Inc., Seattle, Wash. The Laucks Company's glues produce a "moisture-resistant" bond for interior type of construction and are used in largest amounts by the Douglas fir plywood industry of the Pacific Northwest. Thus, the extension of phenolic resin glues with soybean oil meal, will be a second chapter to the story played by soybeans in the development of plywood.

DRYING OIL RESEARCH

Since the consumption of tung or china wood oil in varnishes reached large proportions about 25 years ago, the chemists of the Western World have endeavored to find ways and means of producing a replacement for it. This research activity has led to a number of different developments.

It was found that the trees which produce nuts used in the manufacture of

*One of the laboratories operated by the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U.S.D.A.



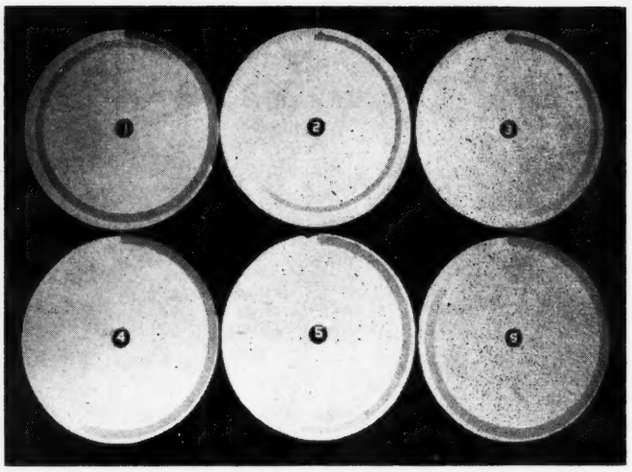


Figure 1 (left). Test pieces of plywood after exposure for 750 hours in a weatherometer. Figure 2 (above). "Set-to-touch" drying rates of soybean and Norconol-S paints: (1) Alkali-refined soybean oil (10 hours), (2, 3, 4, and 5) Norconol-S paints with different conditions of conjugation (4-6 hours), and (6) Non-break soybean oil (8 hours).

tung oil could be grown in our southern states. In the last 15 years, the domestic production of tung oil has increased from practically none to approximately 5 million pounds per year. The production will probably continue to expand as long as a shortage of tung oil exists in this country. In addition to this domestic production of tung oil, the importation of oiticia oil and the Latin-American development of Garcia Nutans oil may continue, and both oils could become industrially important as tung oil substitutes in the postwar era.

The main chemical differences between the class of oils represented by tung, oiticia, and Garcia Nutans, and the class represented by soybean and linseed oils are: (1) The unsaturated bonds are nonconjugated* in soybean oil; and (2) tung oil contains a higher proportion of the polyunsaturated fat acids. It is possible chemically to shift nonconjugated, unsaturated bonds in soybean oil and to change the percentage of polyunsaturated fat acids. By a combination of these two changes, it should be possible to prepare a tung oil replacement from soybean oil.

Industrially, two methods are now available to produce oils which are similar to tung oil in that they are conjugated. By dehydrating castor oil and by heating soybean oil or linseed oil with excess caustic at elevated temperatures, conjugated oils are produced. Dehydrated castor oil is now being used in large quantities in the paint and varnish industry. Limited quantities of alkali-treated soybean and linseed oils are being produced to obtain conjugated oils and conjugated fat acids.

The high-temperature caustic treatment has the advantage that oil is converted to soap, and to obtain an oil by this process, the soaps must be converted back to oil. This conversion increases the expense of the process and increases the color of the final product.

About 4 years ago, the Northern Regional Research Laboratory began an active search for a neutral catalyst which would convert the unsaturated bonds in soybean oil from their unconjugated position to conjugated position. By the use of a neutral catalyst, it was hoped that the conjugation could be achieved without cleavage of the oil to soaps or fatty acids.

It was the conviction of Dr. J. P. Kass, a former employee of the Northern Regional Research Laboratory, that metals normally used to hydrogenate soybean oil could be used to shift the unsaturated bonds. Initial experiments indicated that activated nickel did shift the bonds to the conjugated form to a limited extent. However, the activity was not sufficient to warrant any commercial use, and a search for a promoter which might enhance the activity was made. This search led Sol B. Radlove of this Laboratory to try certain grades of carbon black which are used industrially for bleaching of oils, organic chemicals, and other products. By the proper control of the conditions during activation of the catalyst and in the preparation of the catalyst composition, a carbon black-nickel catalyst was found which will produce 30 to 35 percent conjugation in alkali-refined soybean oil. With esters of soybean fat acids, 10 to 45 percent conjugation was achieved. This oil was named *Norconol-S*** for convenience in identification.

Preliminary evaluation studies conducted by A. J. Lewis, L. B. Falkenburg, and Dr. H. M. Teeter of this laboratory, indicate that the conjugation of the soybean oil has greatly improved its drying properties. For example, paints formulated with Norconol set to touch two to three times faster than alkali-refined soybean oil. A comparable disc prepared with alkali-refined linseed oil gave a "set-to-touch" drying time of 6-½ hours. With some preparations, the through or final drying of the Norconol paint films has been good, but with others, it has not. In addition to the fast initial set, the polymerization rate of soybean oil is enormously enhanced, becoming approximately equal to linseed oil. See Figure 2 above.

Further research on evaluation indicates that Norconol oils may find use industrially but that a tung oil replacement has not been achieved. Further research and developmental work will be needed to establish the industrial value of the Norconol process.

—s b d—

*Conjugation refers to a certain molecular configuration which favors drying of the oil.

**Nor- (Northern); con- (conjugated); ol- (oil); S- (soybean).

SOY FLOUR

(Continued from page 39)

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SOUTHERN SOYBEAN PROGRAM

of the U. S. Regional Soybean Laboratory*

By PAUL R. HENSON

Agronomist, U. S. Regional Soybean Laboratory, Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering.

SOUTHERN farmers, until in recent years, have harvested a very low percentage of their total soybean acreage for seed. As late as 1941, only 15.5 percent of the total soybean acreage in 11 southern states was combined.

While the percentage of total southern acreage of soybeans harvested as an oil crop has more than doubled in recent years, the major portion is still utilized for other purposes. The failure of present varieties to produce satisfactory yields of seed consistently has been in part responsible for the small acreage of oil beans.

The greatly increased demand for vegetable oils because of wartime needs resulted in the expansion of the research facilities of the U. S. Regional Soybean Laboratory during the winter of 1942-43 to include in the cooperative soybean program the 12 southern states along with the original 12 states of the North Central region.

PRINCIPAL OBJECTIVE

One of the principal objectives of the Southern Program is the development of adapted, higher yielding varieties of soybeans for industrial uses. New strains must be not only higher yielding, but resistant to shattering, lodging and disease, and have a content of oil and protein most desirable for industrial utilization. The average yields of the area of 11.1, 13.4, 9.9, and 12.6 bushels per acre for the 4 years, 1941-44 respectively, are entirely too low for economic production of oil beans. The tendency of most of the present varieties to shatter as the beans mature or immediately thereafter is partly responsible for lower yields over much of the region. During the long growing season such diseases as bacterial pustule, bacterial blight, southern blight, pod and stem blight, and many others are serious factors in reducing yields of soybeans over the region. These are the main factors which must be overcome to produce superior strains for southern conditions.

Large numbers of new strains resulting from crosses and plant selections are being tested, or are under observation at many of the southern experiment stations. Attempts to combine the high yields and chemical composition of the northern varieties with adapted late maturing southern strains appear promising. Several F_4 and F_5 strains, from crosses between Arksyo and Dunfield, Chief and Arksoy, and others made by L. F. Williams at the U. S. Regional Soybean Laboratory at Urbana,

have many of the desired characteristics. Very promising material is coming out of a large number of crosses by J. A. Rigney and E. E. Hartwig, in the cooperative program at the North Carolina station. In addition to the crossing program, introductions and plant selections in large numbers are being tested for superiority. It is reasonable to expect that from all of this material, some new strains of soybeans will soon be available, fully capable of filling the needs of the South for an oil bean.

One special project of the breeding program at the Delta Station is the development of a variety that will produce high yields of good quality seed, maturing in late August or early September. The cotton farmers, in particular, desire a variety that will mature before cotton is ready for picking. Varieties such as Macoupin, Patoka, and Gibson will mature at this time, but produce seed of very low quality.

*A publication by the U. S. Regional Soybean Laboratory, a cooperative organization participated in by the Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture, and the Agricultural Experiment Stations of Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, North Carolina, North Dakota, Ohio, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Virginia and Wisconsin.

Many early maturing plants having good to high seed quality have been found in some crosses between northern and southern varieties. To advance this material as rapidly as possible an extra generation is being obtained of these strains by planting them at Weslaco, Texas, in mid-September for late December harvest. Satisfactory yields have been obtained on approximately 600 selections, including strains of early maturity for Texas and Oklahoma.

The main breeding program, however, is concerned with the development of later maturing varieties, as it is fully expected that the highest yielding soybean varieties for the South will be those of late maturity. At the present time we have very few late maturing varieties of commercial importance capable of fully utilizing the long growing season for the production of soybeans. Diseases, in particular, may build up to epidemic proportions, causing serious defoliation if not death to the plant at the critical period of seed setting and seed development. Yields of 50 bushels per acre on fertile soil should not be exceptional when fully adapted, late-maturing soybean varieties, resistant to diseases, are developed.

Pathologists of the region have helped in evaluating varieties and strains of soybeans with respect to disease resistance, and the information thus provided is being used in the breeding program. However, with the increase in number and destructiveness of soybean diseases during the last few years, the disease problem has become urgent. The development of the new soybean disease program of the Bureau of Plant Industry, Soils, and Agricultural Engineering of the United States Department of Agriculture, is expected to greatly facilitate the breeding of disease resistant strains of soybeans.

EVALUATING VARIETIES

An essential part of the soybean breeding program is the thorough evaluating of existing varieties and strains of soybeans. For this purpose a series of uniform nurseries have been established to evaluate the new and improved soybean strains developed by the Laboratory in comparison with the commercial varieties now being grown. In the regional grouping of these varieties according to maturity, the southern strains are entered in progressively later maturing groups designated Groups

(Continued on page 60)

LEO E. HOLMAN

SOYBEAN STORAGE Studies---1944-45

• *Report of the second year's cooperative work on soybean storage at the University of Illinois.*

By DEANE G. CARTER
Chief in Farm Structures
Illinois Agricultural Experiment Station

and LEO E. HOLMAN
Agricultural Engineer, USDA

EXCESS moisture is a primary obstacle to the safe storage of soybeans on the farm. Mechanical drying offers one possibility for improving the quality of soybeans in storage. Structures that prevent the entrance of moisture are necessary for adequate storage. Those are the conclusions from the second year's investigations of soybean storage at the University of Illinois. The study was begun in 1943 by the Illinois Agricultural Experiment Station and the U. S. Department of Agriculture. Altogether some 75,000 bushels of soybeans have been used in tests and more than 60 bins of various sizes, shapes, materials and types of construction are involved in the work.

The 1944-45 studies have emphazied (1) experimental construction and improvement in structures, (2) effect of storage on quality of soybeans and (3) moisture problems and their solution.

EXPERIMENTAL STRUCTURES

There was some damage to soybeans stored in wood framed bins built in the conventional manner with a single layer of matched wood siding. Damage ranged from 1 or 2 bushels per bin up to 30 bushels, with an average of about 5 bushels loss per bin. Most of the damage appeared to be due to the entrance of moisture through cracks, defects or joints in the siding.

The most damage occurred in cases where the following conditions prevailed:

(a) Shrinkage cracks between boards, apparently due to the use of unseasoned lumber in construction

(b) Defects in the siding, such as splitting or large loose knots

(c) Car-siding laid horizontally in the walls

(d) Several end joints occurring on the same upright stud

(e) Relatively high walls and narrow eaves on shed roof bins allowing roof drainage to run down back wall. This condition apparently aggravated the leakage through walls which were not weathertight.

Limited water damage was also found in perforated steel bins, in steel bins having missing or loose bolts, and in plywood and wood panel bins at corners or openings that were not tight. In contrast, the solid or tight walls of steel and plywood bins showed no evidence of moisture penetration or damage. Reinforced waterproof paper applied on the inside of the walls was only partially effective in preventing water damage. Apparently moisture was trapped between the wall and the lining, causing the paper to decay and permitting moisture to come through. Some of the moisture also entered at the edges or beneath the lining causing some spoilage.

To further the study of tight wall construction as well as to evaluate non-critical materials, two bins have been built in which gypsum board was used. Both bins are conventional wood frame. However, one has concrete floor and single siding of 1-inch 2-ply water-resistant board. The other bin has gypsum board floor, protected by an asbestos cement board covering, and the walls are of one-half inch gypsum inside and outside the studs. Both bins held satisfactorily when filled; they will be examined later for evidence of failure or spoilage.

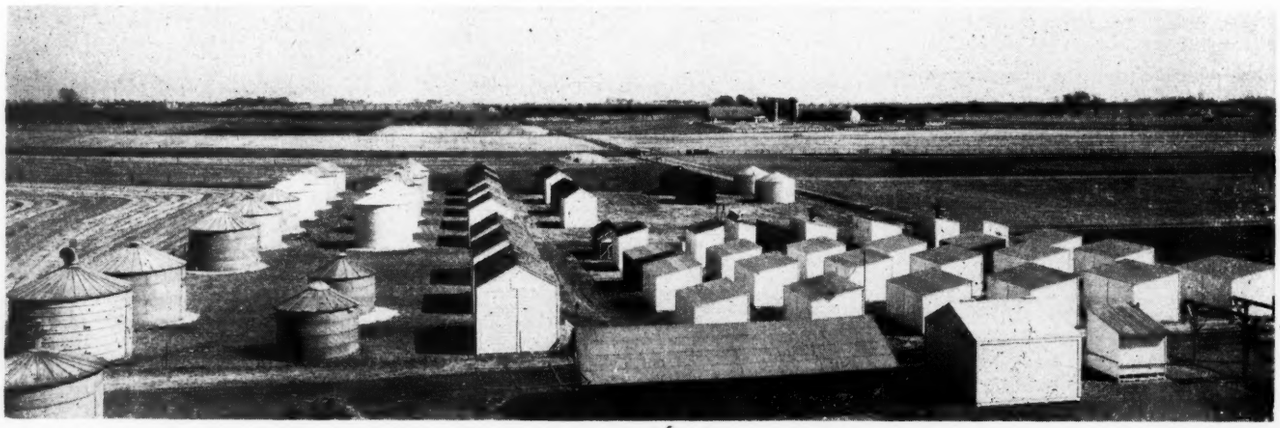
EFFECT OF STORAGE ON QUALITY

There was a close relation between the changes in grade or quality and the moisture content of stored soybeans. At moisture contents of 11 percent or under, there

(Continued on page 70)

A cooperative project conducted by the Illinois Agricultural Experiment Station, the Illinois Natural History Survey, and the Bureau of Plant Industry, Soils & Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture.

A view of the soybean storage site at the University of Illinois.



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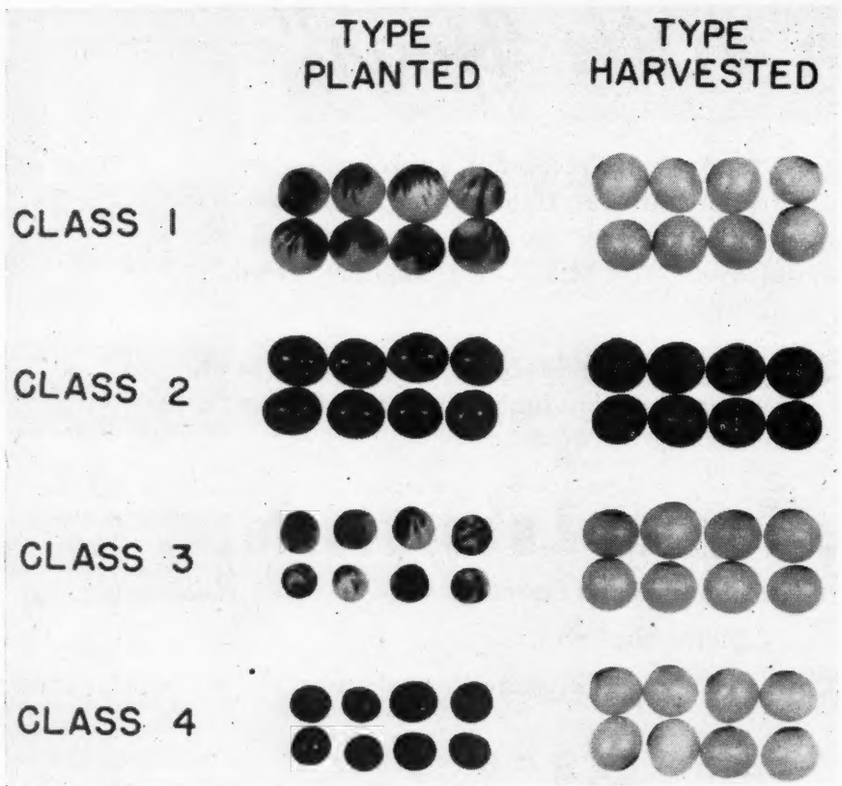


Off-colored beans found in the Lincoln variety and the seed produced by them.

Off-Colored SEEDS in the LINCOLN SOYBEAN*

By L. F. WILLIAMS

Associate Agronomist, Division of Forage Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U.S.D.A., Urbana, Ill.

ALTHOUGH the Lincoln soybean is a relatively new variety, having been in the hands of producers only 2 years, some reports of black and mottled beans have already been coming in. As early as 1942, black beans were noted in the seed from one of the first Lincoln increase plots. This seed was picked over and all black beans removed. Since then, black or black mottled beans have been reported from Ohio, Indiana, and Iowa, as well as Illinois.

As the occurrence of black beans presents a problem in seed certification, it seemed desirable to find out whether such variation is genetic or environmental. Black and mottled seeds were picked out of several samples of Lincoln in 1942 and 1943 and planted in the nursery at Urbana in 1944.

The seed was divided into four classes as follows:

1. Normal size, mottled.
2. Normal size, solid black.
3. Approximately half-size, mottled.
4. Approximately half-size, solid black.

The types of seed planted and the seed produced from them are illustrated above.

The first class produced plants indistinguishable from normal Lincoln and with typical Lincoln seed. There were very few seeds of the second classification to test, and all of these bred true, producing plants indistinguishable from Lincoln but with solid black seed. The third and fourth classes produced plants and seed typical of Lincoln with the exception that there were a few plants with mosaic-type virus in these two groups. There was no mottling in the seed produced in this experiment in 1944, but in general, there was very little mottling at Urbana that year.

BLACK BEANS THE RESULT OF MUTATION

Most of the variation in this experiment arose from environmental causes, but the black seeds in class 2 were evidently the result of a gene mutation from i^h to i, since they bred true to the solid color and produced plants typical of the Lincoln variety in other respects. Apparently this mutation occurs frequently, as it has been observed in a number of other varieties and strains and has occurred at least twice in Lincoln.

One reason that so many black beans have been noticed in Lincoln may be that the large amount of foundation seed was handled carefully due to the interest attached to this variety. However, it is probable that Lincoln is more susceptible to this mutation than are some other strains. Apparently there is some variation among strains in this respect. Chief, Dunfield, Mukden, Scioto, Earlyana, Richland, Bansei, Tokyo, Nanda, and a number of other varieties and selections have mutated to colored seed, but no such mutation from Illini has ever come to the writer's attention although Illini has been very widely grown. In varieties like Mukden and Dunfield the mutation has a light brown or buff seed, in Earlyana, brown, and in Scioto, black, according to the type of pigment present in the hilum of the original type.

POSSIBLE CAUSES OF MOTTLING

It is difficult to ascertain the cause of the mottling in the first class. In general, these beans showed less mottling than class 3. It has been found by several workers that wide spacing and rich soil may cause more mottling on normal plants. It is, of course, well known that some varieties mottle more than others. Owen† in 1927, in discussing mottling in the soybean, mentioned that in a number of cases diseased plants produced mottled seed. He also noted that frequently this seed was smaller than normal.

It is probable that the small seed in classes 3 and 4 came from diseased or injured plants. These small seeds were much more heavily mottled than the normal-sized seeds and a higher percentage of them were mottled. Probably whatever factor was responsible for their small size was also responsible for the heavy mottling. The solid black seeds in class 4 were evidently the result of a more extreme extension of the mottling found in class 3.

WHAT CAN BE DONE?

Picking out the mottled seed is of no benefit as far as improving the following

(Continued on page 61)

*A publication by the U. S. Regional Soybean Laboratory, a cooperative organization participated in by the Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration; and the Agricultural Experiment Stations of Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Nebraska, North Carolina, North Dakota, Ohio, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Virginia and Wisconsin.

†Owen, F. V.: Hereditary and Environmental Factors that Produce Mottling in Soybeans. Jour. Agr. Res. 34: 559-587, illus. 1927.

PARK

(Continued from page 25)

that also have a good to high percentage of oil are the best way of insuring a mature, high quality crop of beans for processing.

Lincoln has made an outstanding record in Ohio for 3 years and it promises soon to replace all other varieties in its maturity class and later. In 1944 Ohio grew 3,285 acres of Lincoln and in 1945 it is estimated at 50,000 to 60,000 acres.

The policy of the Experiment Station and of the Extension Service in Ohio has been to bring to farmers all available information about soybean production and utilization, but there have been no state sponsored campaigns designed to increase soybean acreage. Frequent warnings have been voiced against the danger of growing soybeans in situations and by such methods as might promote soil erosion and depletion. Acting within this policy railroad companies, soybean processors and other industries have given generously of their money and facilities to aid in educating the public about soy beans.

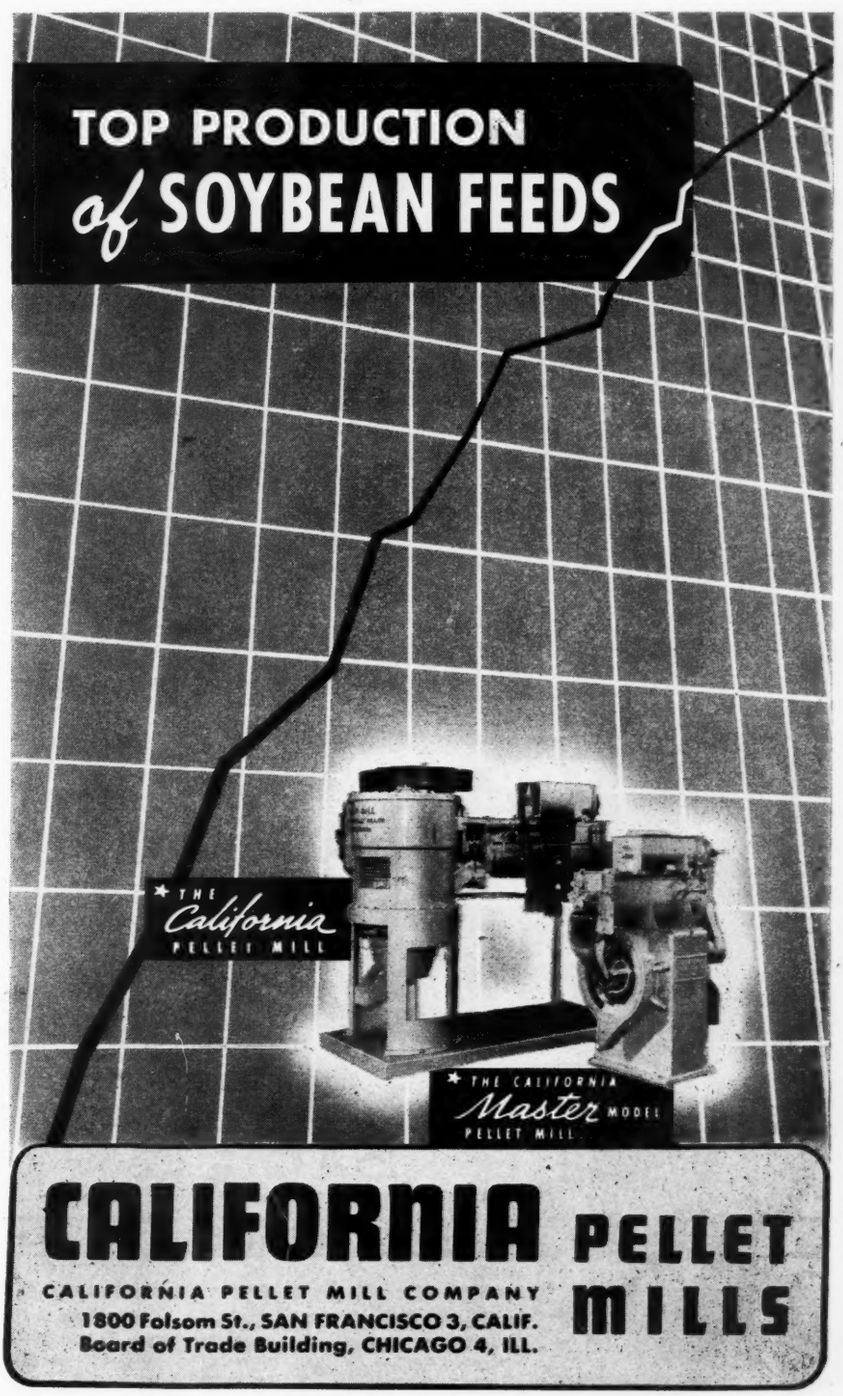
For a time in the 1920's the practice of growing soybeans with corn was fairly common in Ohio. It declined in the 30's and now is almost non-existent. An experimental study of this practice showed that only when the stand of corn was less than optimum did soybeans add to the total yield and even then it was not always easy to make effective use of the soybeans. Farm experience confirmed these findings and so the practice was abandoned.

Methods of planting and cultivating the crop have not changed greatly. Weed control is still a major problem and failure to control weeds in soybean fields has aggravated the weed problem in other crops. Rotary hoe, harrow and weeder help in weed control of solid drilled beans but are inadequate in a wet season. Row culture that permits use of corn cultivators helps but the practice has not become general in Ohio. Beard, Saboe, and others made a survey in July, 1945 in 43 Ohio counties. Of 760 fields observed, only 6.2 percent had the beans planted in rows for cultivation.

One of my early interests in soybeans was in their use for human food. In 1917 C. J. Willard and I sent a truck load of newly mowed Elton soys to the Sears Nichols cannery at Ashville, near Columbus. By running the heavy material through the Scott pea viner several times, and nearly wrecking the machine they obtained 471 pounds of shelled beans besides what were lost in the process of threshing. They canned the beans and pronounced the product good, but they were not ready to pioneer a new product and nothing further was done about it.

Today at Mount Vernon, Ohio, the International Nutrition Laboratory does a thriving business canning green soybeans, soybean milk and a variety of other food products. Soybean oil has become important as a food through margarine, salad oil and shortening. Soy flour is finding a place in baked products and in the meat packing industry. There is much to recommend the use of soybean products for human food, but food habits are exceedingly resistant to change and Americans have not yet reached the place where economy of food resources gets serious consideration.

Whether Cornbelt farmers have gone too far in soybean acreage is a debated question. In Ohio soybeans have replaced some oats, some wheat, some sugar beets, and probably some corn. None of these make occasion for weeping. For in Ohio nearly all the soybeans are grown on approximately level land and their use is the substitution of a slightly soil depleting crop for strongly depleting ones. On the other hand growing soybeans usually results in lengthening the rotation and reducing the proportion of land in grass crops. That is undesirable. Soybeans are grown primarily because they are a profitable cash crop and that will continue to be the deciding factor.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Soybeans and the

FUTURE NEED FOR PROTEIN

By K. J. MALTAS

• *This thoughtful discussion is by the western sales manager of A. E. Staley Mfg. Co.'s feed division.*

THERE is a *potential need* in the United States for an annual crop of 500 million bushels of soybeans. In the same breath, one must admit that the *actual demand* at present, and in the near future, is and will be considerably short of that figure.

NEED FOR PROTEIN

Feeding authorities have shown that in the immediate prewar period (1937-41) that we had an annual need for protein concentrates (oil meal equivalent) totalling about 15 million tons if we were to feed rations that would permit our livestock and poultry to perform with somewhere near maximum efficiency. We have never in our history had more than 8 million tons of protein concentrates (oil meal equivalent) to fill this potential need.

LIVESTOCK RECORDS

Today we are feeding nearly twice as much protein concentrates per animal unit as we did 25 years ago. And yet we are a long way from perfection. Average livestock production records even now present a rather sorry picture. A study of our average production records for various classes of livestock and poultry plainly indicates that our livestock are far from being fully exploited.

Our average milk cow is producing only about 4,800 lbs. of milk annually (9 quarts daily for 9 months); our average hen is laying about 130 eggs per year (an egg every third day); our average hog is taking 8 to 9 months to reach 200 lbs. in weight; our average stock cattle are losing 100 lbs. of body weight each winter; and our average sheep production leaves much to be desired.

THE CAUSE AND AN ANSWER

There are two primary reasons for this low production—(1) low producing ability and (2) poor feeding. Improvement through breeding is the road to increased inherent producing ability and most certainly needs every attention, but improvement through breeding takes time—years with most classes of livestock.

Proper feeding of livestock is the answer to our immediate needs—and one of the factors in our future needs. An important point to remember is that good feeding will begin to show results in a matter of days—not months or years.

FAULTS IN FEEDING PROGRAM

Perhaps the most serious faults in the feeding program of the average feeder are:

1. Failure to use properly balanced rations—particularly adequate protein.
2. Failure to feed liberally.

Professor Morrison of Cornell University in his famous book, *Feeds and Feeding* has the following to say on the matter of adequate protein, and liberal feeding:

Dairy Cows: "The inadvisability of feeding dairy rations too low in protein is shown in recent investigations by the Bureau of the Dairy Industry of the U.S.D.A. Two cows were fed a ration having an abundance of total digestible nutrients, but supplying only 1.25 times as much digestible protein as was contained in the milk—in addition to an allowance of only 0.5 lbs. of digestible protein daily per 1,000 lbs. live weight for maintenance. On this ration, the cows produced 22 to 50 percent less milk and butterfat than on a ration containing a liberal amount of protein. Undoubtedly, most hogs and poultry are also fed rations too low in protein to do the best job."

"Demonstrations by the Indiana Station, the Cornell Station, and the Ohio Station have shown in a striking manner the financial benefits from the proper feeding and care of good cows. In the Indiana demonstration five cows were selected

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MEMPHIS	KANSAS CITY	OKLAHOMA CITY	WICHITA, KAN.
BUFFALO	MINNEAPOLIS	PORTLAND, ORE.	

from herds on dairy farms where records of feed and production had been kept the previous year, but where the animals had not been well fed. Cows were chosen that had been low producers, but they were of good dairy type. They were brought to the Station farm, where they were fed and cared for in the same manner as the cows in the Station herd. They received roughage of good quality and were fed concentrates strictly according to their actual yield.

"On the Indiana farms these cows had produced an average of 5,064 lbs. of milk and 203 lbs. fat for the previous year. The average return above feed costs was $77.64 per cow.

"In the station herd the same cows produced an average of 8,662 lbs. milk and 317 lbs. fat. The net return above feed cost was $135.04 per cow. Some dairymen would doubtless have thought that the cows were being fed extravagantly, for their average feed cost was $28.62 more than for the previous year. However, this investment in liberal feeding, along with better care, brought an increase of $86.02 per cow in the value of the milk produced, and it added $57.40 per cow to the net income over cost of feed. Just as striking proofs of the benefits from proper feeding and care are furnished by numerous instances in the records of cow-testing associations, where dairymen have greatly increased their net income by adopting improved methods of feeding and care."

Beef Cattle: "In an Illinois trial, fattening calves gained only 1½ lbs. per head daily on an unbalanced ration of shelled corn, corn silage, oat straw, and bone meal. Similar calves gained 2.4 lbs. a day on a well-balanced ration, and gave net returns over cost of feed more than double that of those on the poor ration."

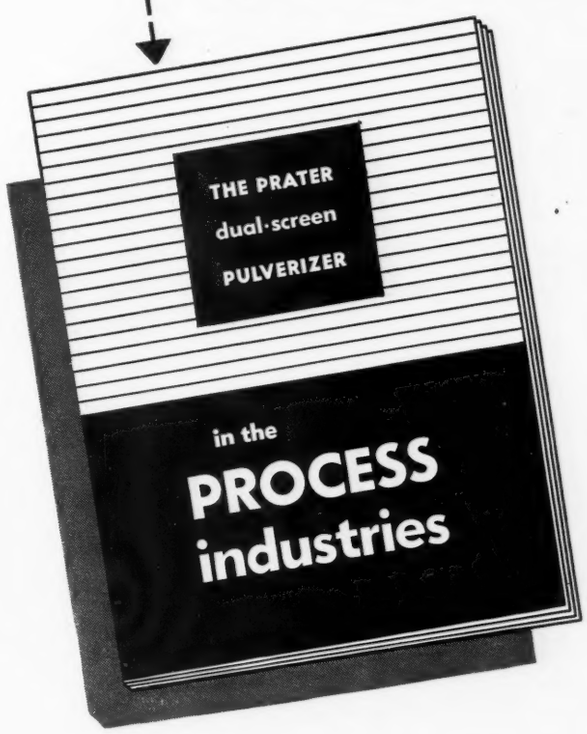
Hogs: "In trials with young pigs weighing 68 lbs. in dry lot, the average daily gain on corn alone was only 0.59 lbs. and 642 lbs. of corn were required per 100 lbs. of gain. This was a poor showing indeed, but the results would have been worse if the pigs had been started on this inadequate ration when still younger. When corn was balanced with tankage, the gains were doubled, and only 387 lbs. of corn and 42 lbs. of tankage were consumed for each 100 lbs. of gain. Furthermore, at the end of the trials the pigs fed corn alone were usually stunted and averaged only 141 lbs. in weight, while those fed tankage in addition weighed over 200 lbs. and were ready for market."

A CROP OF DESTINY

The soybean is the one crop that seems destined to fill our future needs for increased protein supplies for livestock feeding. Today our primary protein concentrates are soybean oil meal, cottonseed

SEND FOR THIS BOOK

If you are interested in the reduction phase of the Soybean Industries



• **This New Book** shows how Prater Service to the soybean industries aids in the reduction phase of processing. In the soybean industry the Prater Dual Screen Pulverizer has become the standard of the industry. Always the principle of Prater Service is based on engineering analysis, co-operative study, test grinds, guaranteed capacity, and control of grain size with particular reference to uniformity and quality of the grind. The 16 pages illustrate and describe what Prater Service means to the soybean industries. No obligation.

Industrial Division

PRATER PULVERIZER COMPANY

1825 S. 55th Avenue **Chicago 50, Illinois**

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meal, linseed oil meal, tankage and meat scraps, milk by-products, and fish meal.

No one seems to expect cottonseed meal production to increase. Few believe that linseed oil meal production will increase. Animal protein concentrate production will vary only with the number of livestock slaughtered. Fish meal production has been rather constant for 10 years. Milk by-products for feed likely will not increase.

There seems to be every reason why the soybean should be the crop to meet this potential need for protein. We need less acres of corn because of increased yields from hybrids. We need less oats because of our constantly decreasing horse and mule population. Soybeans grow well in the primary corn and oat producing areas. In these areas, net acre returns on soybeans are exceeded only by those of corn among the grain crops.

As soybean oil meal production increases we will have a decreasing need for grains for feed within specified limits. For hog feeding for example, the soybean oil meal from 1 acre of soybeans (20 bu.) will reduce the need for at least 1½ acres of corn (75 bu.). In other words, until there are sufficient protein concentrates produced for the average feeder to feed completely balanced rations, an acre of soybeans is worth more to the feeder than an acre of corn in reducing livestock production costs.

Increased Prices for Railroad Ties

OPA authorizes price rise to step up production

The railroads urgently need crossties. They are needed now — will be needed regularly to enable the railroads to continue meeting the need for vital transportation.

Demand has outstripped the supply from usual sources. So we ask American farmers to help.

Cut and sell some of your timber at new higher prices. Even if you have only a few dozen trees of right size and kind, it will help relieve a critical situation.

Prices are good — increase your income — cut now.

For exact details get in touch with your railroad agent or your nearest tie producer or contractor.

AMERICAN RAILROADS

MAINTAINING SOIL FERTILITY

Some state experiment station workers have suggested the desirability of reducing soybean and corn acreage in the postwar period and increasing pasture and small grains as a soil conservation policy. It seems that in view of the need for more proteins for efficient livestock production, that other equally satisfactory approaches to this problem would be more in order than reducing soybean acreage. The problems of agriculture must be viewed as a whole—not in piece-meal lots. Soybeans remove less plant foods from the soil than many other crops, and at the same time the fertilizer value resulting from the feeding of a ton of soybean oil meal runs three to four times as great as that resulting from the feeding of a ton of grain.

PROTECTION

It is most important that our government provide the American soybean with protection in the domestic market in the postwar world. This protection should take the form of adequate import duties on all competitive oils, oil meals, and oil seeds to permit the American soybean grower to secure maximum saturation of his product in the domestic market. No good purpose is served our people by permitting low priced competitive products, produced on low standards of living, to enter our country providing we can produce a unit of that crop or product (or one of equal utility) with less man hours of labor than other countries. Nowhere in the world is a bushel of soybeans produced with less man hours of labor than in the United States. No place in the world are competitive oils, oil meals, and oil seeds of any kind produced with less man hours of labor.

INCREASE DEMAND GRADUALLY

While the potential need for more protein concentrates at present is great, the actual demand will increase gradually during the years to come. The science of animal nutrition is comparatively new and quite complex in nature. Our agricultural colleges, ably assisted by our commercial feed companies, are doing a marvelous job in developing the science of feeding and in promoting better feeding and management practices.

Actual demand may never reach the potential need but as the demand for protein increases, the soybean will be ready and waiting. The soybean is the answer to many of the postwar livestock production problems of America.

Whither Acreage and Price?

EDITOR'S NOTE: See "Washington Digest" page 76 for the latest word on a probable lowering of acreage goals and support prices by U.S.D.A.

By PORTER M. HEDGE

WASHINGTON, D. C.—Now that the war is over, what happens to soybean production and prices?

As for next year, a check of responsible officials indicates there is little question but what soybean producers again will be called upon for high production—in the neighborhood of 10 million acres.

Despite sharp military cutbacks, supplies of fats and oils are expected to continue tight. Moreover, though lend-lease is being closed out, European relief requirements for fats and oils stand at an all time high. Most officials expect that some new financial arrangements will be completed to continue relief shipments into liberated areas.

As to the future, any estimate of probable government action running more than a year ahead would be little more than speculation.

There are, however, a number of clues to longer term postwar trends.

One of the most important affecting the soybean industry is that the price support for soybeans guaranteed for 2 years after the end of hostilities by the Steagall Amendment is for 90 percent of parity.

This means that unless there is a much greater postwar demand for soybeans than now appears in sight, the support price will tend to drop down to the 90 percent of parity "floor."

On the basis of July parity (and parity will change up or down as the cost of things farmers have to buy fluctuates), a 90 percent of parity price for soybeans would be approximately $1.50 a bushel.

The expected postwar decline in soybean prices from the wartime price support peak is figured here to bring about an automatic adjustment in soybean acreage within a few years.

Another factor which most officials feel will tend to adjust soybean acreage downward is the inevitable postwar drive for greater soil conservation. This probably will affect the "fringe" area of soybean production more than the more stable, heavy producing sections which have allowed for greater soybean acreages in normal crop rotations.

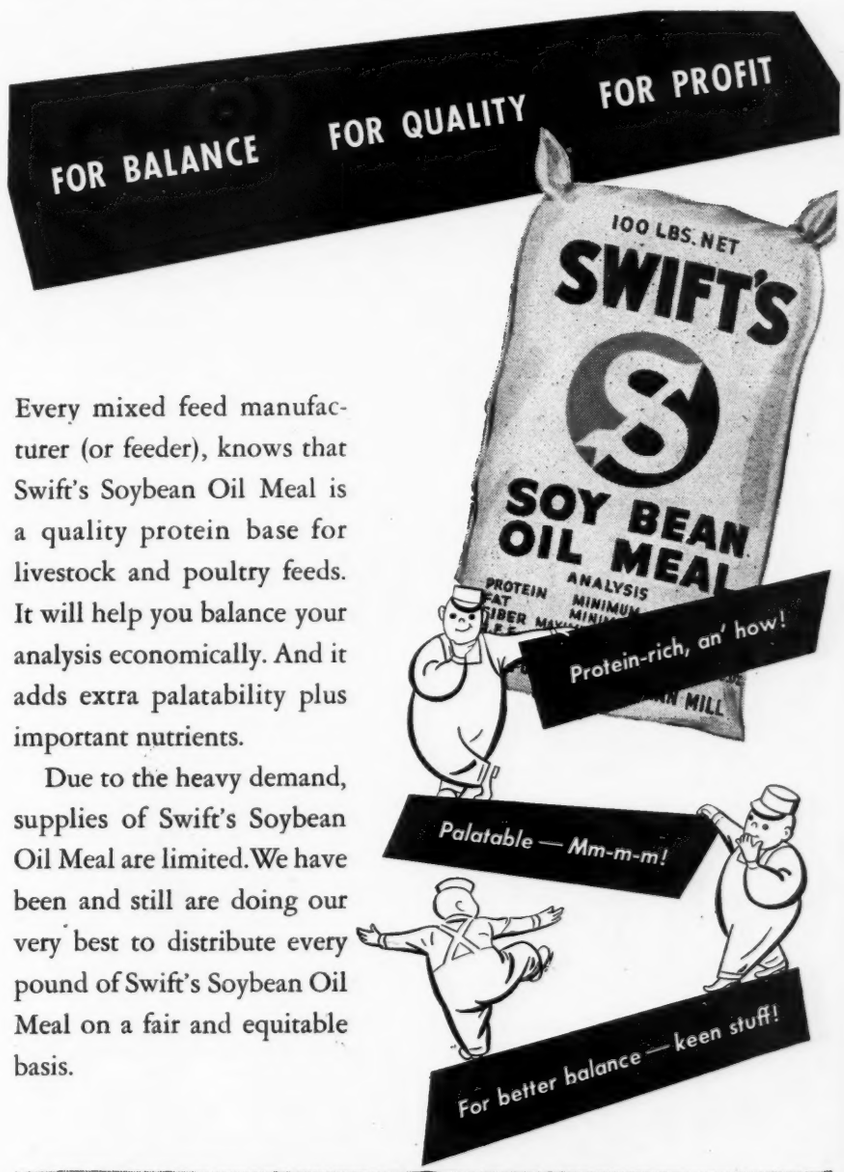
As to the Administration's attitude on postwar imports, the general trend is in the direction of letting down the tariff barriers as far as possible without upsetting the domestic economy.

How deeply the trend may cut into the soybean industry, if at all, is still an unknown.

State Department is likely to exercise more sayso over import policy during the postwar period than the Department of Agriculture. The State Department's general attitude is that the United States must take front rank in leading the world into an era of peace and that freer trade is one of the cornerstones of lasting peace.

Key policy man on foreign trade is Assistant Secretary of State Will Clayton, former world cotton merchant and an ardent advocate of free trade.

Within the Department of Agriculture, the postwar emphasis is expected to be placed on finding new uses for agricultural products, including soybeans, hunting out new markets (such as the Donald Payne mission to Europe to sell liberated peoples on the value of vegetable proteins), and expanding old markets.



Every mixed feed manufacturer (or feeder), knows that Swift's Soybean Oil Meal is a quality protein base for livestock and poultry feeds. It will help you balance your analysis economically. And it adds extra palatability plus important nutrients.

Due to the heavy demand, supplies of Swift's Soybean Oil Meal are limited. We have been and still are doing our very best to distribute every pound of Swift's Soybean Oil Meal on a fair and equitable basis.

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MORSE

(Continued from page 35)

ing increasing amounts of vegetable soybeans.

The mature and green vegetable soybeans offer an excellent means of making additional vegetables available the year around. The dry beans are cooked and served in a variety of dishes in practically the same manner as other dry beans. The most difficult problem, however, in suggesting soybeans for table purposes is that many people have tried to cook the field types and have obtained rather disappointing results. Unfortunately, during the past 2 or 3 years packaged dry soybeans, largely of the field types, have been placed on the market. In most of such instances the soybean has been rated as an undesirable food.

From extensive reports, there can be but little question that once people have tried the vegetable varieties, properly prepared, the demand for them will increase. In using the dry soybean, it should be known that soybeans are rather nutlike in texture in contrast to the softness of other beans. The attempt to make soybeans soft through prolonged cooking is one of the most frequent mistakes. The nutlike texture of the cooked soybean should be looked on as one of the desirable characteristics. The choice of a variety for use as a dry bean is as important as it is for green vegetable beans if flavor and texture are to be considered.

Investigations have been conducted with flours made from vegetable varieties of soybeans for the purpose of learning whether measurable differences in flavor and other characteristics could be found between them and commercial flours manufactured from field varieties. At the Illinois Experiment Station, the general conclusions from such tests were that the best-flavored flours came from some of the vegetable varieties and that most of the vegetable types produced better flours than the field types. It would appear that better flavored flour might be produced commercially if the most promising of these vegetable types were used in the manufacture of soy flour instead of the field varieties. Moreover, some of the vegetable varieties have been found especially well suited for making special products, such as bean milk, bean curd, and roasted beans. As larger supplies of seed of these varieties become available, such uses undoubtedly will be greatly extended.

The introduction of vegetable soybeans possessing qualities superior to the field varieties for table use in the green and dry forms has been a most important factor in overcoming much of the earlier prejudices of the American people against the soybean as a food. When we again return to normal conditions, the prospects appear exceedingly promising that the soybean in various forms of food will be an accepted constituent of the American dietary.

With increased demand for concentrated foods with efficient protein and high vitamin content, it is highly important that soybean food products be made available in a variety of forms to consumers, that consumers be educated as to the nutritive value of these products, and given information as to ways of using them in palatable dishes of accustomed forms.

Although much progress has been made in the placing of vegetable soybeans on the market, much work still remains to be done. In view of the great interest shown in vegetable varieties by consumers, growers, and food manufacturers, more extensive investigations are essential to develop disease-resistant, non-shattering vegetable types.

More tests are also needed to determine the suitability of different varieties and strains as green shelled beans for the garden, canning, and freezing and as dried beans for soy flour, roasted beans, and other food products. The proper processing and standardization of soybean foods that appeal to the people's tastes should also receive further consideration.

NUTRITIVE VALUE of the SOYBEAN

Extensive nutritional studies by many laboratories indicate that soybeans rank higher in food value than other beans and peas.

Proteins, fats, minerals and vitamins are the most costly elements of our diet. The soybean contains an unusually high percentage of protein and fat. It is also a good source of important mineral elements, containing more calcium and phosphorus than any of the cereals and it is a good source of iron, potassium, and magnesium.

In addition to vitamins A, B, and G, the soybean is said to contain varying amounts of vitamins C, D, E, and K.

Soybean protein has a great advantage over other types of protein, especially animal protein, in that it is alkaline in its chemical reaction or ash.

Soybeans have a definite place in the low starch diet as they are low in carbohydrates or starches.

Butler's Soya-Butter

— ANALYSIS —

Protein 1%, Fat 79.2%, Carbohydrates 1.8%

NON FATTENING. The fat of soybeans is of a peculiar quality and it is not stored in the body as is animal fat; therefore you may eat freely of Butler's Soya-Butter without the fear of putting on additional weight.

H. O. BUTLER

NON ALLERGIC. Many people who cannot tolerate ordinary butter can readily assimilate Soya-Butter and find it easily digested, because its fat is of a different quality, coming, as it does, from a vegetable source.

NO CONTAMINATION. There is no animal product of any kind in Butler's Soya-Butter; hence there can be absolutely no danger of the transmission of disease germs from an animal source. The 100% vegetable source of Butler's Soya-Butter is your guarantee of purity.

FOR THE TABLE. You will find that Butler's Soya-Butter is a superior spread which will never turn rancid.

FOR THE KITCHEN. You can use Butler's Soya-Butter for cakes, pastry, deep frying, and other kitchen use in any recipe calling for butter.

Other Butler Foods

BUTLER'S VEGETARIAN CHOPS are a meat-like vegetable product that look like pieces of liver and have a taste quite similar to meat. They require no points.

BUTLER'S SOYA-NUT-LOAF is a good meat substitute at a low price. It makes excellent sandwiches and can be prepared in many ways for a main dish food.

BUTLER'S VEGEBURGER has somewhat the appearance of hamburger and it is especially good in patties or balls. It has a savory flavor.

BUTLER'S MEATLIKE is meat-like in texture and taste and can be prepared in roasts, croquettes and in many other ways to take the place of meat.

BUTLER'S SOY-NUT-CHEESE is a smooth spready sandwich filler and is especially desirable for salads.

Other Butler foods will be forthcoming from time to time.

BUTLER FOOD PRODUCTS, Cedar Lake, Mich.

Get MORE SOYBEANS at Lower Cost

...with the Massey-Harris *Self-Propelled* CLIPPER COMBINE

Massey-Harris didn't wait until Soybeans became America's fourth largest crop to develop combines for soybean harvesting, but pioneered the first combines to successfully harvest soybeans in Illinois. Later, they produced the original, straight-thru, scoop-type Clipper Combine that was a natural for soybeans. When the Massey-Harris Self-Propelled Combine astonished the world with its performance in the Harvest Brigade of 1944, the same Self-Propelled principle was adapted to the experienced 7-foot-cut "Clipper" Combine, bringing new savings of crop, manpower, time, fuel and money to soybean growers.

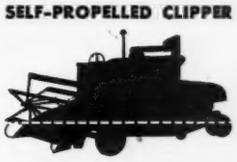
No longer need you have a tractor ahead of your combine to tramp down precious soybeans on opening cuts. The One-Man Self-Propelled Clipper cuts everything ahead of it like a lawnmower.

THE "CLIPPER" KNOWS ITS SOYBEANS

The full-floating platform and extra-low adjustment of cutter-bar gets down under low-hanging pods, giving you more bushels of cleaner beans. The 5-foot rasp-bar cylinder has a simple adjustment for changing speed to suit soybean threshing. The concave is easily adjustable front and rear, accommodating any condition of crop. The knife travels 6 inches, over the length of two guards, instead of only 3 inches over one guard.

Choose the combine that "knows its soybeans," either the Massey-Harris Self-Propelled Clipper or the tractor-drawn models. Ask your Massey-Harris dealer about it . . . and about power-plus tractors, high-speed plows, quick-attaching tractor cultivators, other cost-cutting implements.

AND HERE ARE ADVANTAGES EXCLUSIVE IN THE MASSEY-HARRIS SELF-PROPELLED CLIPPER



LOW CENTER OF GRAVITY, with engine mounted low down; results in better performance on uneven ground and easier handling.

AUGER-TYPE GRAIN TANK UNLOADER makes unloading easy, even "on the run." Power gears are fully enclosed and run in oil.

"EYE-VIEW" LOCATION OF GRAIN TANK permits operator to check the tank without leaving his seat.

MASSEY-HARRIS

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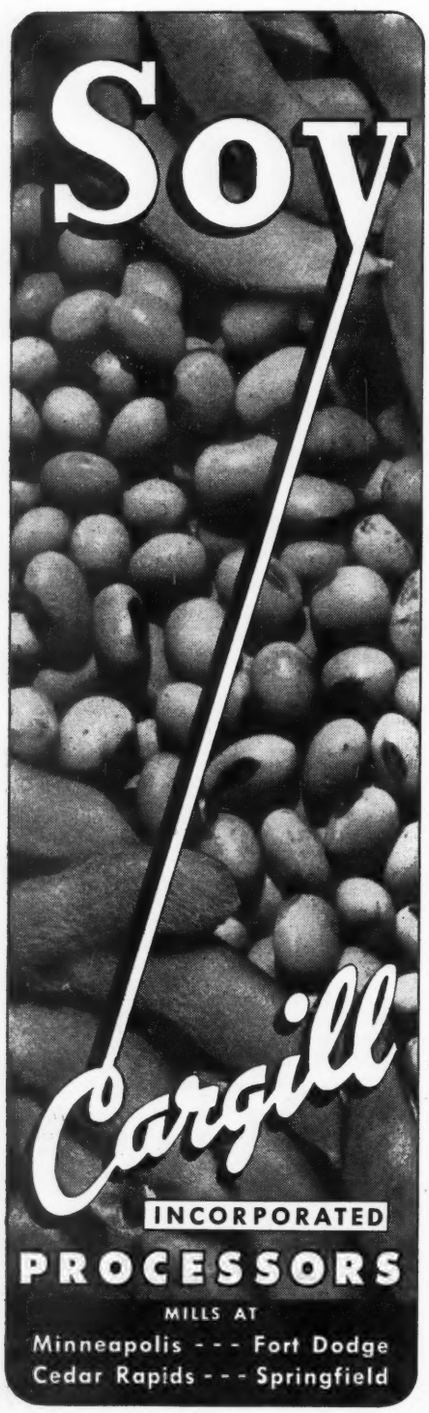
HENSON

(Continued from page 47)

V, VI, VII, and VIII. At the present time there are very few strains of proper maturity for Group V, so particular effort is being made to secure superior selections for the northern part of the southern region where strains of this maturity are needed.

Testing soybean varieties on a regional basis began in 1943. An excellent picture of the good and bad characteristics of the varieties is taking form in that results include yield, lodging, plant height, seed quality, disease resistance, shattering resistance, and chemical composition for each variety at many locations. In planning the tests each year, varieties showing little promise are dropped while new ones are added. New strains are entered in the regional tests as soon as they show promise in local tests. Testing over a wide area will give the plant breeders an evaluation of the new strains in 1 or 2 years, that could hardly be obtained by testing for several years in one section or area. In addition, basic information is secured on the various varieties and strains, pointing the way to the plant breeders for crossing varieties to obtain improvement of a strain in one or more characteristics.



In general, the varietal response over the region has corresponded to differences expected due to length of day, rainfall, and fertility levels, with the exception of the lower coastal area of southeastern South Carolina, Georgia, Florida, and southern Alabama. In this area the varieties Monetta, C.N.S., Palmetto, and Missoy, all introductions or strains developed from introductions from Nanking, China, appear to be the most promising. Ogden, Volstate, Wood's Yellow, Tennessee Non-Pop, all of which are high yielding varieties in other sections, are definitely unadapted to this region.

The varieties in Uniform Tests in the rainfall deficient area of Texas and Oklahoma have shown little promise. Yields have been very low except under irrigation. New strains developed in the cooperative breeding program are under observation at a number of locations in this area.

Along the northern edge of the region, good yields of fair quality seed were obtained from a number of varieties from Group IV, S100, a strain developed by the Missouri station and C101 developed by Indiana, in particular, having been very productive. Low yields of poor quality seed result, however, from growing these strains farther south.

PROMISING VARIETIES

There are a number of promising varieties in the later maturing groups of which Ogden, in Group VI, is the outstanding variety. Developed by the Tennessee Station, this variety has produced high yields all across the upper half of the southern region. The principle objection to Ogden is that under very dry conditions it will shatter as it matures. Volstate, another high yielding variety developed by the Tennessee Station, has performed well in the tests. This variety matures approximately 2 weeks later than Ogden and shatters very little. N41-90, a new strain developed by the North Carolina Experiment Station, is equal, if not superior, to Volstate in yield, and is of particular interest at this time because of its high oil content. The new strains Acadian, Pelican and L.Z., developed by the Louisiana Station, definitely have a place in the lower South. These are late maturing, tall growing, non-shattering strains with a good oil and protein content.

NEED FOR FLEXIBILITY

The production of soybeans as an oil crop in the South will depend somewhat on the flexibility of this crop with respect to varying crop practices. In this connection, farmers in some sections of the South have found the practice of following early potatoes and winter grain with soybeans to be a profitable one. If productivity can be maintained over a wide range in dates of planting, without adversely affecting the chemical composition of the seed, the acreage of soybeans should be greatly increased. In order to obtain more complete information on this phase of soybean production, cooperative Uniform Dates of Planting Tests are being conducted at a number of locations.

These consist of three or more varieties representing early, medium, and late maturing strains planted at 3-week intervals beginning in April. Yield data between different dates of planting at any one location have been quite variable.

General trends in the effect of date of planting on yield and chemical composition are evident from the data, although erratic fluctuations in the data at some locations, apparently due to climatic conditions, tend to obscure such trends. There were no consistent differences in yield between plantings made in April and May. In most of the tests, the yields from late June and July plantings were distinctly lower than those from plantings made earlier in the season. The percentage of oil declined with the very late plantings, while a slight but progressive increase in the iodine number of the oil occurred with lateness of planting. The percentage of protein was not consistently affected by date of planting. Partial and total failures of June and July plantings were reported at some locations both years. These failures due very largely to droughts at planting time, are indicative of the risk involved in late plantings, particularly in the upper South.

The prompt testing of new strains over a wide area in Uniform Tests, obtaining complete agronomic and chemical data in a short time; the distribution and exchange of new breeding material with other cooperators; the evaluation of cultural requirements of this crop in the widely different areas; and the study of and development of disease resistant strains—all are factors which should result in the development of superior strains of soybeans for industrial utilization for the South.

WILLIAMS

(Continued from page 50)

year's crop, since the experience of investigators has indicated that such seed will produce plants as free from mottling as will unmottled seed. Picking out the black seeds of the mutant *i* type will not insure against black seeds in the next year's crop since the black type is recessive to yellow, and heterozygous types will still be in the population. The only method of eliminating the black seeds is to use *pedigreed* seed which is known to be free of the mutation. A supply of such seed was produced at the Illinois Station in 1942 and made available to cooperating states.

To develop this seed, over a hundred individual plants of the Lincoln variety were harvested and the seed from each plant sown in a separate row. At harvest time all rows not typical of the Lincoln variety were discarded. Each of the remaining rows was harvested separately and the seed examined for black beans. All rows showing black beans were discarded and the remaining rows composited to produce the foundation pedigreed seed. If a new mutation occurs in this material, it will be necessary to establish a new pedigreed lot. Such a mutation ordinarily occurs in a pollen or egg cell of a plant and this will then unite with a normal cell to form a plant embryo. Since this mutation is recessive, the resulting plant will have normal-colored seeds and it will not be until the following year that black seeds appear. Thus it is not until 2 years after the mutation occurs that any evidence of it appears.

Since mottled beans in Lincoln will produce typical Lincoln seed the next year, there seems to be no reason to remove them from the seed before planting. There would also seem to be no particular reason for discriminating against them in certification.

Because some of the small mottled seed possibly came from diseased plants, and some diseases may be seed borne, it may be desirable from this standpoint to screen these out, but no great benefit is to be expected from such removal since the percentage of seed-borne disease is likely to be small.

There is good reason for discriminating against solid-colored black beans, since this experiment has shown that black beans of normal size can be expected to breed true to the black color. In regard to certification, it is suggested that these solid-black beans be considered as varietal mixtures. It is probable that no lot of pure Lincoln seed contains enough of these mutant black beans to bar it from certification.

There has been a suggestion that it might be desirable to increase the black-seeded Lincoln as a separate variety. This would be quite undesirable since the discount on black soybeans sold for processing would mean a lower return to the grower.

Market Street

We invite the readers of THE SOYBEAN DIGEST to use "MARKET STREET" for their classified advertising. If you have processing machinery, laboratory equipment, soybean seed, or other items of interest to the industry, advertise them here.

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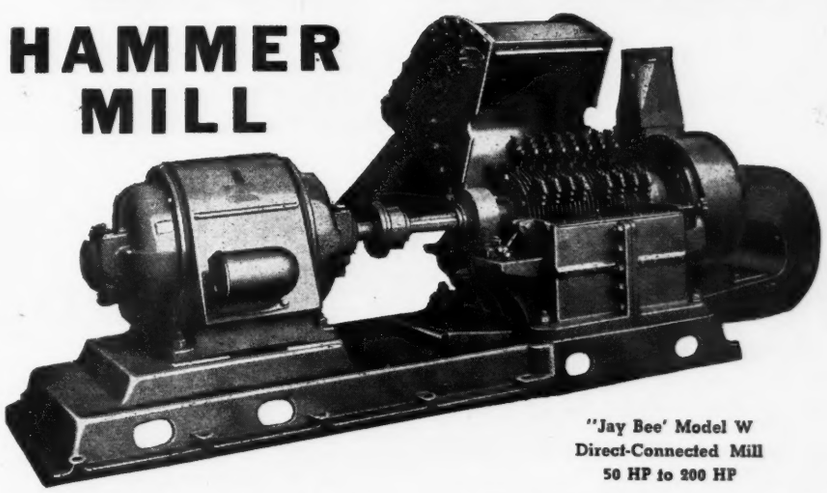

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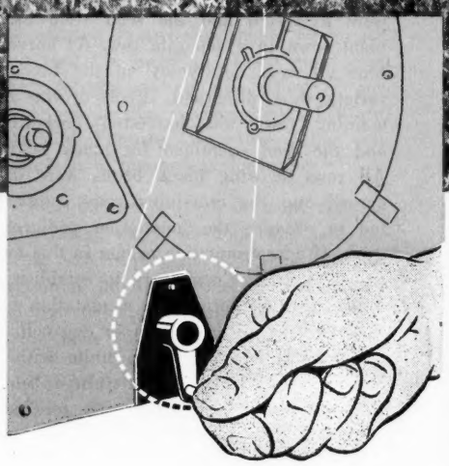

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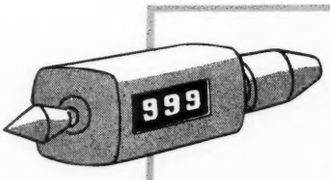

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REED

(Continued from page 24)

a necessary evil but it can be demonstrated that it is not necessary to withhold contracts with crushers until 10 days or so before crushing starts. The smartest maneuverer in the field can't be fast enough on his feet to meet a situation like that. Commodity has evolved what they call "Northern" and "Southern" contracts. However slick it looks on paper, the "Southern" contract doesn't work out in the mill and the crusher has found himself in a "heads you win, tails I lose" involvement.

The crusher has a slight handicap, perhaps, in that his equipment is generally hydraulic. In any case he is vastly interested in adapting himself to processing beans. The cottonseed crusher can see a steadily rising demand for soybean oil meal from millers and feeders in his territory. He, too, would like to look around the corner at tomorrow's possibilities. He is learning, too. He knows that those beans that were so nice and dry last year were harder to process than the damper ones of the year before, even though those of last season had at least a pint of oil more than those of 1943. The crusher is an old hand at extracting oil from seed. He will manage it, Commodity and other confusions notwithstanding.

We are country shippers. We should have admitted it before to save the hapless reader the embarrassment of discovering late that he has been reading stuff that any such Quixotic citizen would write. We are of that lowly, humble class who, when instructed to do the business of shoveling beans into boxcars on a gross margin of 2.4 percent bows right and left, clicks heels together and says "yes sir". Boxcars? Once in a while one shows up. We always have to rebuild those few that do appear. We are credited with having built sides and top on a flat car that strayed by. And we stood weeping while the sides parted from the floors of two ancients before they could get from our elevator around to the main line. The local vice president in charge of yard operations the next afternoon finally got us to agree, in Mack's Bar, that that was funny.

We put the calipers on all loads of beans that come to us, carefully and conscientiously assaying the dockage at, say, 4 percent. The shock that comes when the returns show that some inspector has found 15 percent soon wears off. We fill a 40 car contract before we get back a single analysis and final settlement and don't worry about it because we have learned that the Lord takes care of drunks and fools also.

One of the compensations—there are some—is that we like to do business with the people we do business with. We argue with farmers, give them a lot of free advice, and not one has taken a punch at us yet. We dare to tell them that 50 bushels of clean beans dumped on 50 bushels of dirty ones won't help the dirty ones much, and that they should be fined, possibly jailed, for not installing a recleaner on their combine, and they can take their dirty beans somewhere else. Sometimes they do and nobody gets sore. We pontificate the pronouncement that clean beans pay dividends now and that, post-Commodity, clean preparation plus higher oil content will pay extra dividends in cash plus enhancing the community's reputation and they are considerate enough not to walk away.

The receiver has proven to be a good egg too. His mill may have been so far away from the nearest official inspector that he permitted one of his men to take a hatful of beans from the car for a sample with astonishing results. In every case a gentle suggestion has brought proper adjustment. In that connection, may we ask when the powers that be will get around to the realization that sampling a car of soybeans is different from sampling a car of any other grain? Beans, coming from close to the ground are essentially dirty. We found, with the help of an obliging crusher, that a true sample can be drawn by probe only by probing seven times on each of three levels in one car, a total of 21 probes.

Of course we shall eventually have receiving cleaners at all elevators, just as eventually we shall have storage bins at country points. We shall also have enough combines to handle the harvest promptly just as we shall have special bean planting and tillage tools for handling beans in 28 inch rows instead of 36.

We believe the plains area and the delta region will produce the bulk of the soybeans because, so far, these areas can do the best job and because erosion is no problem there. At this moment our local region is the principal producer for the South and Southwest, there being no comparable production yet in those areas.

We believe that soybeans, processed and un-processed, will move down the Mississippi in increasing quantities for export. It is certain that soybean oil meal has become so fixed in the routine of formula feeds, no less in the South than in the North, that there can be no lessening of the supply. The versatility of soybean oil and soybean oil meal was not common knowledge 5 years ago. It is common now. Consequently there is no skepticism in this house. We are proceeding confidently with no thought of having some day to shift that part of our energies and investment to channels other than soybeans and modestly prideful of our small part in this surging new field of American agriculture.

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Prospect for Record Soybean Crop

The national soybean crop may set a new bushel record in 1945 as a result of exceptionally favorable growing weather in August, the U.S.D.A. crop reporting board forecasts.

The September 1 forecast is for 202,589,000 bushels, 14½ million bushels above the August forecast and about 5 percent larger than either the 1944 or 1943 crop.

The acreage to be harvested for beans was placed at 10,956,000 acres, 564,000 over the acreage estimated last month and 94,000 acres above last year.

Here is the indicated production in the 15 major soybean producing states: Ohio, 24,969,000; Indiana, 28,640,000; Illinois, 74,844,000; Michigan, 1,815,000; Wisconsin, 767,000; Minnesota, 6,080,000; Iowa, 38,100,000; Missouri, 10,770,000; Kansas, 2,888,000; Virginia, 1,581,000; North Carolina, 2,088,000; Kentucky, 878,000; Tennessee, 1,309,000; Mississippi, 1,218,000; Arkansas, 3,875,000.

In large areas the crop is still late in maturity and would be damaged by early frosts.

September 1 reports of *Soybean Digest* correspondents follow:

ARKANSAS

Tildon Easley, extension agronomist, Little Rock, Ark.: Maturity 2-3 weeks late on average. Some beans as early as usual, but many fields planted late. Expected per acre yield 15 bu., except for very late beans. Prospects look good for high yield, especially if moisture conditions remain favorable. Total yield more than 1943, probably about same as 1944. Could be more if late beans develop and set crop. Very late beans could be seriously damaged by early frost. Not any serious pest or disease damage yet.

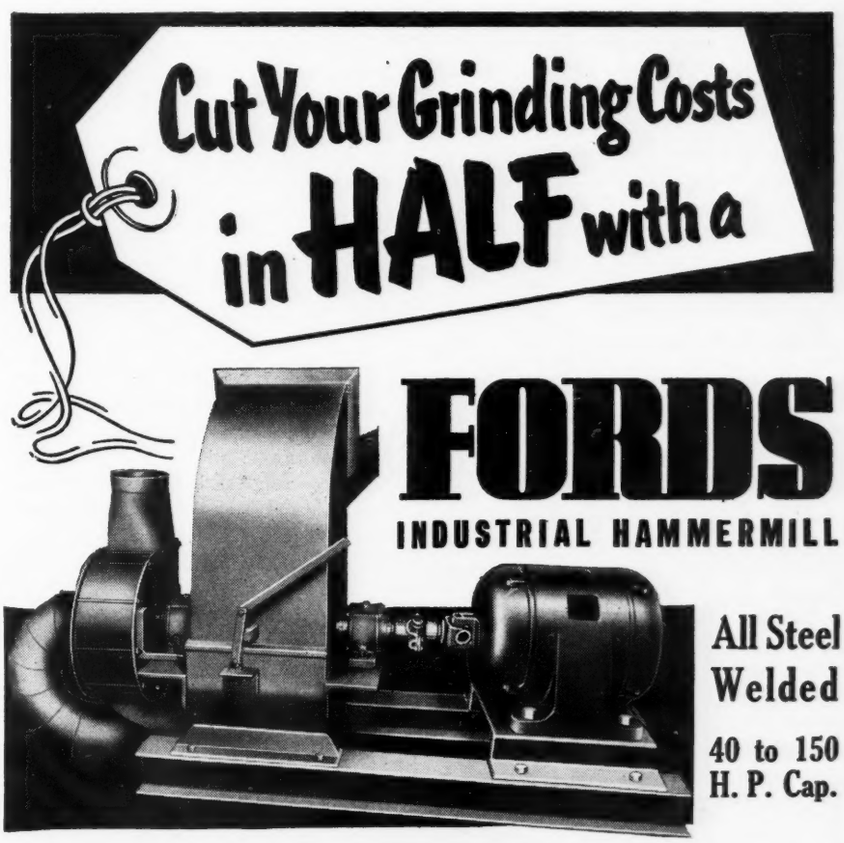
Jacob Hartz, Stuttgart, for east central: We have had an ideal growing season throughout all of Arkansas, 12 inches more rain to date than last year. Early varieties blooming and putting on beans. Should make a bumper crop if army worms do not get it. Acreage down 10-15% from last year.

ILLINOIS

J. C. Hackleman, professor crops extension, University of Illinois, Urbana: With a normal fall heavy soybean producing area should mature crop in good shape. A September frost as serious as that of 1942 would damage 25-33 1/3% of the beans. No particularly serious diseases or pests reported to date.

Russell S. Davis, Clayton, for west central: Maturity 2-3 weeks late. Expected yield 15-18 bu. Doubt if increased acreage will offset lower per acre yield. Looks like smaller crop than 1944. Some fields beginning to show grasshopper damage on borders. Three-fourths of crop would be damaged by frost before October 1. Bulk of crop in full bloom and on short plants. Need about 40 days without killing frost to mature most fields. First 25% of fields planted are rank growth and well podded, which should insure plenty of seed in case of early freeze.

Walter W. McLaughlin, for Decatur territory: Maturity 2 weeks late. Normal yield if weather holds. Total yield 10% less than 1944. No pest or disease damage



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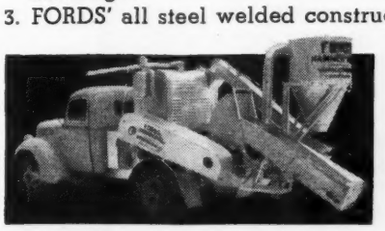

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to speak of. Crop could be seriously damaged by early frost.

J. E. Johnson, Champaign for Champaign and adjoining counties: Maturity 10 days to 2 weeks late. Expected yield below 1944. Disease damage growing each year. Only small percent of crop in danger of frost damage. Due to heavy rainfall in July and first half August weed situation worst ever. Even best row growers have weeds this year. Labor shortage one factor in not being able to remove weeds that have sprung up to surprise of those who felt they had this problem under control. Many fields will suffer heavy losses and harvesting will be delayed from weeds. Shattering losses will be heavy from delay. Elevators have moved all grain and with aid of railroads should be able to handle crop without shutdowns. Not too early to appeal to railroads for every possible assistance.

Frank S. Garwood & Sons, Stonington, for south central: Maturity 2 weeks late. Expected per acre yield about same as 1944. With greater acreage total yield greater. Slight pest or disease damage. There would be considerable damage by early frost, as this section has highest percentage of late soybeans it ever had. Current crop may be either greatest or poorest ever depending on first killing frost date.

INDIANA

Ersel Walley, Walley Agricultural Service, Fort Wayne, for northeast Indiana and northwest Ohio: 90% crop week to 10 days earlier than usual. 10% later than normal. Expected per acre yield 8-10 bu. more than 1944. Greater total crop than in 1943 or 1944. Some traces of insect or pest damage. 10% crop in danger of damage by early frost. Dry weather has hurt in some spots in Ohio. For entire section crop is most promising in history of soybean growing here. This raises question as to use of "normal" in reporting crop as new as soybeans. Earlianas showing up well again.

Peter J. Lux, State AAA, Indianapolis: Maturity retarded prior to last few weeks. Expected per acre yield higher than last year, especially in last year's heavy drouth areas. No pest or insect damage reported. Some damage on crop if frost prior to Oct. 1, especially in late planted fields in south half. North half reports have improved during recent weeks.

IOWA

Howard L. Roach, Plainfield, for northeast Iowa: Maturity 90% normal. Expected yield per acre 23 bu. Total yield 90% 1944. No pest or disease damage. Possible damage by early frost since weather too cool and development backward.

John Sand, Marcus, for northwest: Maturity 10 days later than normal. Expected yield per acre 25 bu. or more providing frost doesn't come too early. Beans tall and look well. Many fields have excess weeds due to late wet season. Most beans exceptionally tall but apparently not so heavily podded.

KANSAS

E. A. Cleavinger, extension division Kansas State College, Manhattan, for eastern: Maturity 15-20 days later than normal. Some fields about normal. With late frost estimated state average will be 13 bu. No serious pest or disease damage. 10-15% may be damaged by early frost.

MICHIGAN

A. A. Johnson, Farm Crops Department, Michigan State College, East Lansing: Maturity 10 days-2 weeks late. Expected yield per acre 10% better than average. Pest or disease damage not extensive. 30-50% of crop would be damaged by early frost.

MINNESOTA

W. G. Green, Lakefield, for southwest: Maturity 10 days late. Expected yield per acre 14-20 bu. Total yield 3-5 bu. less than 1944. No pest or disease damage. Beans doing very nicely. Quite a lot planted very late, doubtful if will be harvested. Are in all stages at present.

John W. Evans, Montevideo, for southwest central: 80% maturity compared with normal. Expected yield 20-25 bu. Total yield 100% 1944. No pests or disease damage. Plenty moisture. Beans still growing. Possible damage by early frost.

MISSOURI

G. H. Banks, Ralston Purina Co., Kansas City: Crop in northeast Missouri late. Section immediately contiguous to Kansas City very dry, but nice rains have fallen in other sections of my territory.

J. Ross Fleetwood, extension speciakist, University of Missouri, Columbia: Maturity 2-3 weeks late. Indications are for 75% per acre yield of last year. Acreage higher than 1944. Not much change in total yield. Some grasshopper damage. 25% would be damaged by early frost. Beans growing well but late planted crops are blooming at low height which probably means low yield.

Harry A. Plattner, Malta Bend, for central: Maturity 10-15 days late. Expected per acre yield 20-25 bu. Some Lincoln and Chief to yield 35. Total yield near that of 1944. Very little pest or insect damage. We had plenty of moisture during early part of growing season but very dry during August. Beans doing much better than corn. Very little possible dam-

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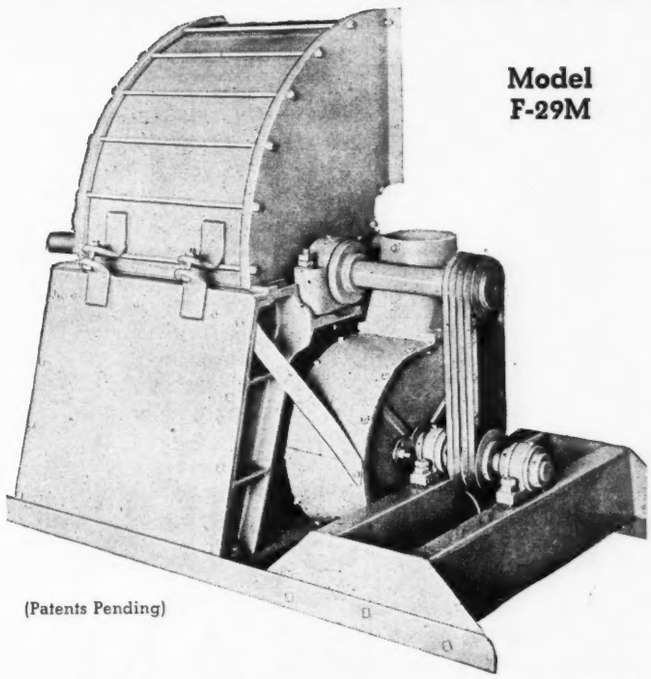

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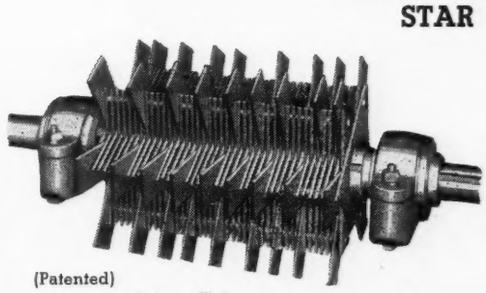

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2915 NORTH MARKET STREET WICHITA, KANSAS

age by early frost in Missouri River bottom.

NEBRASKA

Marr Soybean Processing Co., Fremont, for east: Maturity 10 days late. Expected per acre yield 23 bu. Total yield about same as 1944. No pest or disease damage. Crop looks good and rapidly catching up. Frosts after October 1 will not hurt many soybean fields.

NEW YORK

F. P. Bussell, Cornell University, Ithaca: Planting delayed by wet, cold spring. At least 10 days later in condition than normal. Expected per acre yield 15-20 bu. Total yield somewhat lower than 1944 if no frost before October and farmers have weather favorable for harvesting. No pest or insect damage observed. Much injury will be rule if frosts come early.

NORTH CAROLINA

E. E. Hartwig, North Carolina State College, Raleigh, for North Carolina coastal plains: Rainfall has been excessive since late June. Most fields have excellent growth but still too early (Aug. 1) to make estimate of yield.

NORTH DAKOTA

B. E. Groom, secretary Greater North Dakota Association, Fargo, for Red River Valley of North Dakota: Maturity rapidly nearing normal as result of ample moisture and most favorable weather for maturing all crops. Expected per acre yield 25-30 bu. if this weather continues. No pest or disease damage noted. During past 3 weeks have driven over many sections in Red River Valley and noted the unusual development of beans and corn. Frost is determining factor. Damage by early frost would be very heavy. Stalks are heavier than usual and weed growth bad in fields following last cultivation. As we have a very large hay crop beans for hay not needed so badly as usual but if cut for forage would give very gratifying yield.

OHIO

D. F. Beard, department of agronomy, Ohio State University, Columbus: Maturity about week late. Expected yield 18-20 bu. as state average. Some fields of Lincoln will exceed 40 bu. Higher total production than 1944 but lower than 1943. Pest or disease damage about normal. Some fields in areas with excessive rain earlier very late. Acre yield and size of beans would be reduced considerably by early frost and some by frost at normal time.

G. G. McIlroy, Irwin, for central or west central: Maturity normal. Expected per acre yield 22 bu. Total yield about equal to 1943, better than 1944. No pest or disease damage of significance. If frost comes at usual date no especial damage will occur. Although each year there is an increased acreage of rowed and cultivated beans there is still a substantial acreage sown solid. Solid plantings are weedy this year almost without exception. This means more in rows next year. At Irwin it is very dry as of August 31. July rainfall was 2.7 inches, August .48 inches.

VIRGINIA

W. W. Lewis, assistant agronomist, Blacksburg: Maturity normal. Expected per acre yield good, with higher total than 1944. No pest or disease damage noted.

WISCONSIN

Geo. Briggs, College of Agriculture, Madison: Maturity 2 weeks behind. Cool nights and excessive moisture stimulates growth of plant and delays pod growth. Midseason varieties blossoming 2-4 weeks late. Should frost hold off to Sept. 20 30-40% crop will come through. Will need good October to save 80% of crop. Some fields damaged by mildew.

John P. Dries, Saukville, for southeastern lake shore district: Maturity 15 days late. Expected yield 20 or more bu. per acre. Not enough pest or disease damage to speak about. 75% would be damaged by early frost. Row plantings showing excellent results compared to solid drill plantings.

HOOSIER
SOYBEAN
MILLS

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ARNOLD

(Continued from page 37)

eral welfare of China and the Chinese than did the whole sum disbursed as it was. In our relief and other philanthropic contributions to China, we should take care not to pauperize those whom we would help. It is equally important that we refrain from creating temptations or opportunities for graft and corruption in the administration of relief funds.

The Chinese are accustomed to paying for what they get. They are naturally industrious, intelligent, ingenious, practical and possess a large fund of common sense. They have far more respect for a good bargainers than for an eternal Santa Claus. They are undergoing the greatest transition in the whole 4,000 or more years of their history. They are virtually hurdling from an ancient into a modern civilization. They are determined to industrialize, which means they must modernize their whole society. This industrialization, involving as it does one fifth of the human race and raising China's economic levels, is bound to have a profound affect upon the rest of the world, and especially upon the countries bordering on the Pacific. Thus, it is patent that we shall show good sense when we make our relief to China thoroughly constructive and contributory to helping the Chinese to help themselves.

In our application of modern science and organization to the handling of the soybean, we have already done very much which can be of service to the Chinese. This is a field in constructive philanthrophy or relief in which we are especially competent to aid the Chinese. We can aid them in direct relief in helping them to make the soybean of greater value and service to them in a nutritive sense, and also indirectly in showing them greater uses for this miracle bean in modern industry. Furthermore, our relief may also extend to helping them to place Chinese students and technicians in special schools and plants in this country where they can acquire knowledge and skill in handling the soybean which may make them larger factors in raising the economic levels of their society through greater prosperity.

Through helping the Chinese to get the most out of their little soybean we are tapping one signally fertile field for constructive relief, helpful to both China and to ourselves.

Excellent Administrative Opportunities

Well established and rapidly growing feed and grain company has openings for young men between ages of 23 to 35 with three or more years of college training in one of several fields of engineering, namely mechanical, chemical, electrical, etc., to be trained for positions as production and operations manager of Company owned feed mixing and vegetable oil extraction mills.

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Write to Cargill, Incorporated, New Chamber of Commerce Building, attention Personnel Department, Minneapolis, Minnesota, giving complete details, such as education, nature of experience, family and draft status, and other related facts in first letter.

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Famous cooks and expert chefs insist on La Choy Soy Sauce not only in making genuine Chop Suey, Chow Mein, and other Chinese dishes, but also in frying steaks, chopped meat, meat balls and hashes — in making gravies and stews — for serving on the table as a condiment for steaks, chopped meat, roasts, chops, croquettes, Spaghetti, fried eggs and sea food.

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JOHN SAND, MARCUS, IOWA

STORAGE

(Continued from page 48)

was little decrease in germination, and under 12 percent there was no significant change in fat acidity, market grade, insect infestation or temperature.

At moistures of 12 percent or higher, the following results were observed:

(a) Several bins with 13 or 14 percent moisture soybeans graded "sample" at the end of 10 months because of a musty odor. All soybeans with 14 percent moisture and above were musty and graded "sample" after storage from January to July.

(b) The loss of germination was almost complete after 12 months storage for soybeans with moistures above 13 percent and severe with 12 to 13 percent moistures.

(c) Insect infestation was slight; some insects were found in bins with soybean moistures above 13 percent.

(d) Heating was not a serious problem in the past year. Some deterioration occurred in a few bins where high moistures resulted in temperatures up to 108° F.

(e) Fat acidity increased noticeably at higher moistures.

MOISTURE PROBLEMS

As indicated by the foregoing summary, many of the difficulties of soybean storage are associated with moistures of 12 percent or higher. Serious problems are involved, therefore, in getting low moistures at the time of storage, and maintaining them throughout the season. In the event of adverse conditions of maturity and harvesting it is important to condition the soybeans for safe storage.

A check made at a local elevator in east central Illinois from September 25 to October 16, 1944 gave apparently typical results for a normal season. Of 325 truck loads examined, 11 loads had moisture contents of 11 percent or less; 45 loads ranged between 11 to 12 percent; *and 336 loads, or more than 85 percent of the total deliveries, had 12 percent moisture or above, which is too high for safe long-time farm storage.*

There is a considerable fluctuation in moisture of soybeans from the combine throughout the day. While they are often too high in moisture early in the day, favorable drying conditions may reduce the moisture enough for safe storage by late forenoon or early afternoon.

Irrespective of the moisture condition at the time of storage, moisture redistribution occurs within bins causing an accumulation of excess moisture in the upper center during the winter months. In extreme cases, 12 percent soybeans have reached 18 to 20 percent in the upper center of bins. The accumulation in several bins of 1944 soybeans was as much as 1.5 percent from November to the end of January. Farmers report that stirring the surface to a depth of from 6 to 24 inches is effective in breaking up high concentrations and preventing most spoilage through the fall and winter. Stirring the surface has little effect, however, on moisture in other parts of the bin, and will not condition high-moisture soybeans for storage through the summer.

TO REDUCE MOISTURE

The storage studies included tests of methods for reducing the moisture in stored soybeans. No improvement in condition has been noted from the use of tubes, ducts, perforated sidewalls or roof ventilators. An electrically operated fan has given satisfactory results in good drying weather, reducing soybeans with an initial moisture of 14 to 15 percent down to 10.5 to 11 (wet basis). About 0.05 kilowatt hours were used for each percent moisture reduction per bushel.

A gasoline motor driven fan was used on one test under similar conditions, and with comparable results. With more air circulation, and by utilizing the heat from exhaust gasses and radiation, much faster drying was possible. About 0.1 pint of gasoline was used for each percent moisture reduction per bushel.

It seems evident on the basis of work to date that storage problems increase markedly with moistures above 12 percent. It is likely that mechanical drying and perhaps supplementary heat may be necessary to condition high moisture soybeans for safe storage.

The Coming Relaxation of

COMMODITY MARKET RESTRICTIONS

Two developments of great importance are obviously getting nearer:

1. Re-opening of futures markets still closed because of world conditions—creating enlarged interest in commodity trading as a whole.
2. Elimination of "ceilings", "floors", and other restrictions on free price movements.

When normal conditions in these two respects have been restored, trade interests will need fast, *valuably* interpretive information. This type of material, the kind that experienced businessmen can use advantageously, is what our firm supplies regularly—in regard to all important commodities. The fact that we have 88 offices, 60 of which are located in areas where commodities are either grown or processed, and all of which are interconnected by 25,000 miles of leased wire, is obviously an aid in speedy transmission of such information.

We would like to have an opportunity to consult with you now regarding what specific services we can perform for you. Such a consultation can be arranged at your pleasure, either with one of our executives in our home office at 70 Pine St., N. Y., or one of our offices nearer you, if you prefer. In the latter case, just write us your name and location and we will tell you the proper individual for you to contact.

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The important Country Elevators gather the harvested crops from America's farmers. They clean, grade, store and reship to processors and mills all over the country.

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Did you ever go to a church cake sale? Notice the difference in cakes? All made with the same ingredients—but a difference in "Know How." Careful step-by-step processing — with modern equipment—and years of experience is the formula for the difference in Spencer Kellogg protein meals.

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PROCESSORS OF MEALS · NOT FEED MIXERS

GRITS and FLAKES... FROM THE WORLD OF SOY

Pete Marr has sold controlling interest in the Marr Soybean Processing Co. and the Marr Grain Co., Fremont, Nebr., to John J. Vanier, Salina, Kans. The new firm is to be known as the Fremont Cake & Meal Co. Harry E. Wiysel, manager of the grain department for Marr, has been retained as general manager.

* * *

Cottonseed crushers from Texas and Oklahoma met with the Texas feed advisory committee at Dallas, Tex., August 20, to determine conditions under which mills in the Southwest area might buy and process Cornbelt soybeans. The hydraulic mills of the cottonseed crushers can be adapted for soybean crushing but the margin of profit is low, said A. L. Ward, educational director of the National Cottonseed Products Association.

* * *

One hundred and nine contestants from 17 counties have enrolled in the 1945 Nebraska soybean yield contest. Hans Nielsen of Fremont is believed to have the largest soybean acreage — 300 acres — ever grown by one man in Nebraska.

* * *

Agricultural Laboratories, Inc., reports that Bob Erickson, for the past three years on leave of absence supervising an assembly line in a powder making plant, is back on the job and will soon be contacting his friends in the trade for Legume-Aid inoculants.

* * *

A war veteran may not be granted ration points for processing soy foods, Office of Price Administration ruled August 17. This was on application of Peter Y. Taylor for shortening to operate a small soy food factory at Mineola, Long Island. Ruled OPA: "In order to enable the maximum number of veterans to go into businesses using rationed foods . . . it is essential we limit the types of activity in which veterans may use the foods to those which require relatively small quantities. For this reason the manufacture of soy food products by veterans has been eliminated." Taylor had been on 91 combat missions with the Army air corps, was awarded the Air Medal and the Distinguished Flying Cross.

* * *

Lee Longacher has become associated with Neff & Fry Co., Camden, Ohio, as sales manager of the industrial bin division. Longacher has had extensive training in the mechanical field, construction and sales work.

* * *

Bemis Bro. Bag Co., St. Louis, has issued a catalog under the title, "Parade Your Products the Bemis Way." It is illustrated and contains many items used by seedsmen.

* * *

Col. Rohland A. Isker, director of the Quartermaster Subsistence Research and Development Laboratory, has been awarded the honorary degree of Doctor of Science by the University of Maine. Colonel Isker developed the famous K ration which employs soy flour.

10th ANNIVERSARY FOR WOODSON-TENENT

Congratulations to Woodson-Tenent Laboratories, Memphis, Tenn., who celebrate their 10th anniversery as analytical and consulting chemists in the industry this month.

In reaching this 10th milestone in their business, the partners, P. F. Woodson and E. H. Tenent give credit to the loyalty and support of their many friends in the industry. "Without friends no business can survive," they stated. "We feel very grateful that we have been able to inspire confidence by giving real service to our customers throughout the years."

The firm is justly proud of the progress they have made during the past 10 years, which went through depression and war-torn years. The young partners made a name for themselves in a small rented laboratory on Front Street. Three years ago they bought a modern building and installed the latest in equipment, a few doors from their first location. They have also, established branch laboratories at Cairo, Ill., and Blythville, Ark., in order to render better service to their customers.

Since 1935 the Woodson-Tenent Laboratories have analyzed over 500 million dollars worth of products.

It is also a proud fact that most of the customers who were on the firm's books when they opened their first small laboratory in 1935 have remained through the years, with each year bringing many new customers.

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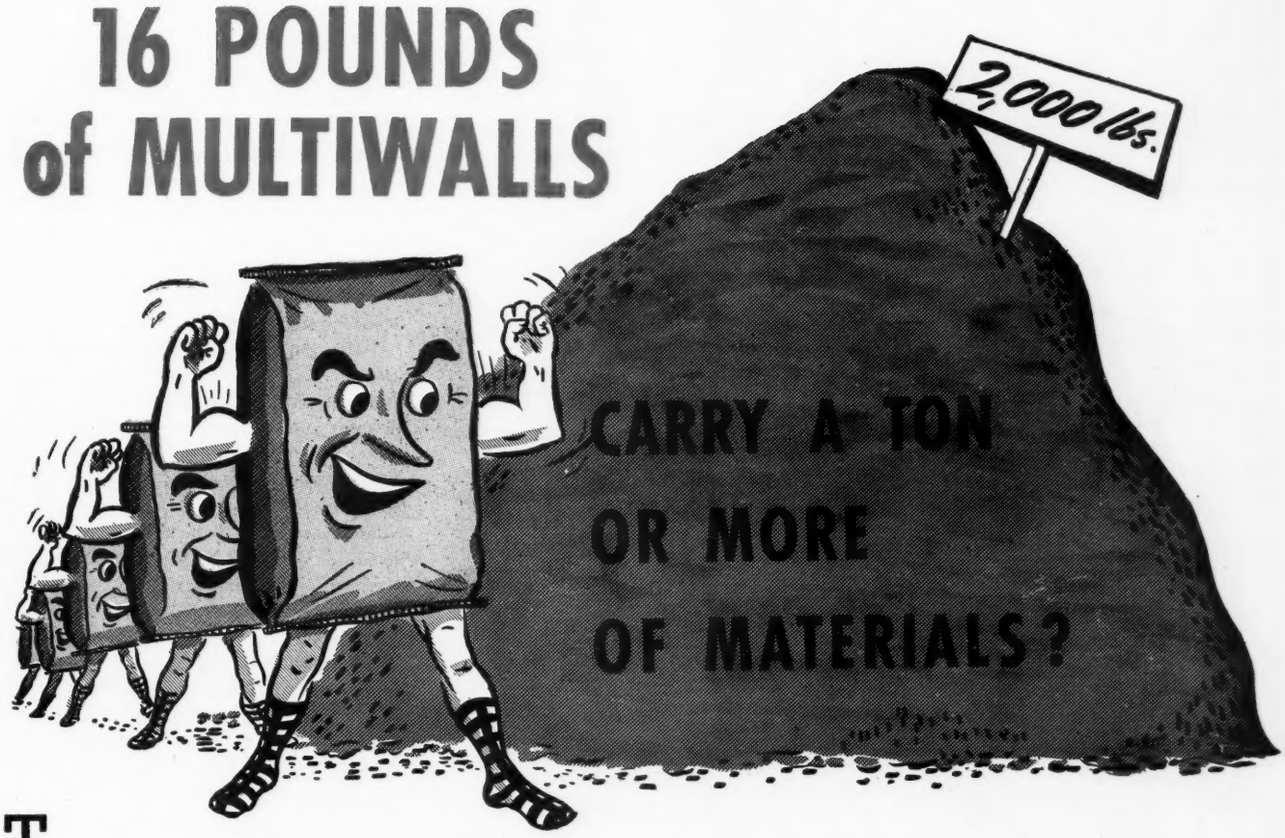
How can 16 POUNDS of MULTIWALLS



The average 100-lb.-capacity Multiwall Paper Bag is only 8/10 of a pound in weight. Only 16 lbs. of Multiwall bags, therefore, are required to *carry and protect a full ton of material.*

These figures hold an important story of Multiwall packaging efficiency and economy. They also indicate the strength and toughness of the paper of these bags. This paper is made according to exacting specifications and must pass exhaustive tests concerning strength, flexibility, and moisture resistance.

Multiwall design is another reason for Multiwall stamina and efficiency. Bags are constructed of several plies made in tube form so that each bears its share of the burden.

ADDITIONAL MULTIWALL ECONOMIES

Multiwall Paper Bags are tight and sift-proof. They help keep storerooms tidy. And, because materials do not readily cling to their smooth interior walls, they empty quickly and cleanly . . . cut retention losses to a minimum.

St. Regis bag filling machines and methods offer still another worthwhile economy. Results have shown that these machines definitely speed filling operations, reduce labor and equipment costs, and release manpower for other jobs.

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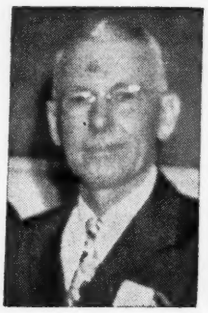
WALTER McLAUGHLIN

HARRY PLATTNER

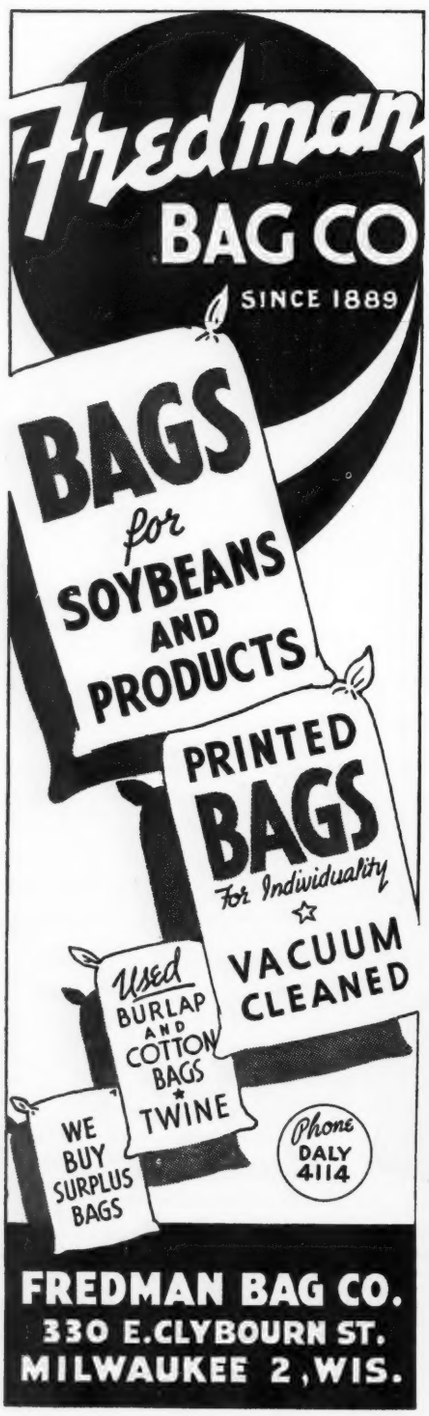
JOHN SAND



JACOB HARTZ

JOHN DRIES

GILBERT SMITH



BOARD HOLDS OVER

(Continued from page 17)

catur, Ill. Walter is president and general manager of Decatur Farm Management, Inc. He has had several years experience as farm adviser, 13 years as a professional farm manager, and for 4 years served as director of the Illinois State Department of Agriculture. He is now a member of the board of trustees of the University of Illinois.

Secretary—Jeanne M. Strayer, Hudson, Iowa. Wife of Editor Geo. M. Strayer, Jeanne is carrying on with the secretaryship and the business affairs of the Association while George is in service. She is also acting secretary of Associated Hybrid Producers, association of Iowa hybrid seedcorn producers. The Strayers are partners in Strayer Seed Farms, producers of soybean seed and hybrid seed corn.

Treasurer—J. B. Edmondson, Wampas Farm, Clayton, Ind. One of the old time soybean men, "Ben" also is a purebred Guernsey breeder.

Director from Indiana—Ersel Walley, Ft. Wayne, Ind. Ersel is manager of Walley Agricultural Service, well known firm of farm managers.

Director from Wisconsin—John Dries, Saukville. John is a dairy farmer and a producer of canning crops.

Director from Ohio—David G. Wing, Mechanicsburg. "Dave" is the son of "Alfalfa Joe" Wing. Alfalfa and soybeans are the long time interests on his farms, which he has been operating since 1922. He has been selected by Firestone as a Master Farmer.

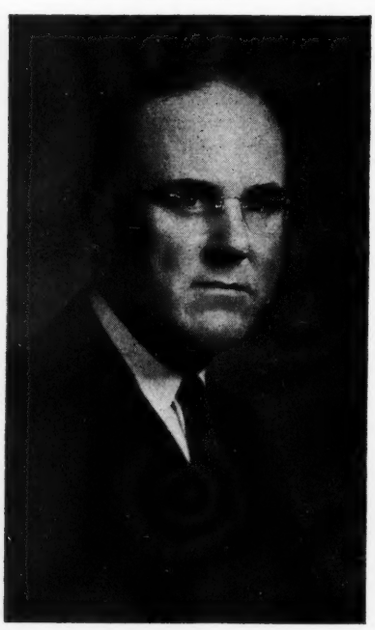
Director from Missouri—Harry A. Plattner, Malta Bend. Harry practices a well balanced system of farming on his 652 acres in Saline County. He holds both Master Farmer and Master Conservationist titles.

Director from Illinois—Gilbert Smith, Newman. Gilbert is engaged in raising and processing hybrid seed corn in the firm of John T. Smith & Sons. He has farmed continuously since high school.

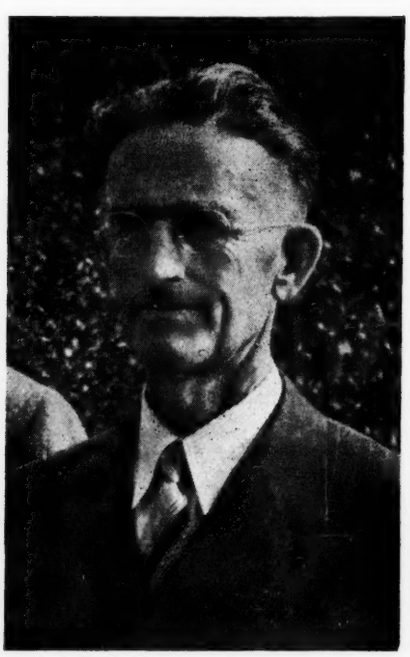
Director from Iowa—John Sand, Marcus. Owner of Sand's Seed Farms, John was the first to raise hybrid seed corn in his county, and among the first to raise soybeans extensively. He is the inventor and manufacturer of the Iowa ear corn test probe.

Director from Arkansas—Jacob Hartz, Stuttgart, Arkansas, is the owner of Jacob Hartz Seed Co., and a grower of soybeans.

D. G. WING



J. B. EDMONDSON



How to Use Spergon with Legume Inoculants On Soy Bean Seed

Repeated tests have indicated the high value of Spergon in preventing seed decay and increasing emergence, especially in a cold wet planting season.

Tests also show that Spergon is compatible with legume inoculants and that you may obtain double benefits by treating seed with Spergon and with bacterial cultures. Here's how it's done:

1. First treat seed with Spergon. The recommended rate is two ounces per bushel. Your state experiment station will advise dosages to meet special local conditions.
2. Inoculate only with strong cultures containing viable bacteria and apply excess amounts over that recommended for untreated seed.
3. Use just enough water to make culture cling to seed.
4. Plant within two hours after inoculating.

Write us for further information about the use of Spergon to increase soy bean stands and yield, and for copy of Soybean bulletin.

Advantages of Spergon

- Protects seed against decay caused by soil-borne and seed-surface fungi.
- Safe to use. Non-irritating and non-injurious to the operator when applying it to seed.
- Long lasting. Spergon does not deteriorate with age. May be applied months in advance of planting.
- Self-lubricating. No graphite needed in planter.

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WASHINGTON Digest

Cut Price Support? There were indications as the *Digest* went to press that the fats and oils branch of USDA's new Production and Marketing Administration might call for a slightly lower 1946 soybean acreage total — between 9 and 10 million acres as compared to over 10.3 million acres grown for harvest this year. Though official confirmation was lacking there also appeared to be a strong possibility that the price support for 1946 soybeans might be lowered to around $1.80 per bushel.

A belief that imports of South Pacific oils may be flowing back into this country in larger volume than earlier expected by the time the 1946 crop is crushed is said to be back of the current shift in thinking on 1946 domestic crop requirements.

The Department of Agriculture is paying minute attention to legislation which assures the farmer minimum price floors for 2 years after the end of the war.

Secretary of Agriculture Clinton Anderson has his commodity officials working overtime trying to figure out next year's food requirements, plan 1946 production goals, and cut out new price support patterns to fit the first year of agriculture reconversion.

Beyond the marketing of next year's crop, postwar price support legislation and management becomes of prime importance.

There are at least two important things to remember about farm price support legislation:

(1) Existing legislation merely sets up the machinery to maintain the prices of certain farm products at not less than 90 percent of parity. It will take the grease of Congressional appropriations to make the machinery work.

(2) It can be taken for granted that neither Congress nor the Administration will offer farmers a guaranteed minimum price level without some return assurances as to the amount of a crop that's produced and the way it's marketed.

Here are the essential facts about farm price supports as obtained from a detailed study of present legislation, and discussions with legal, price, and policy officials:

Three groups of commodities are now receiving support. They are: The six "basic" crops—corn, wheat, cotton, rice, tobacco, peanuts for nuts.

The 14 "Steagall amendment" commodities—hogs, eggs, chickens, turkeys, milk, butterfat, dry peas, dry beans, American-Egyptian cotton, potatoes, cured sweet potatoes, soybeans, peanuts and flaxseed for oil.

Some 140 other commodities,

Ninety percent of parity (loans 92½ for cotton) are mandatory for 2 years after the official end of hostilities for the six basic crops—unless marketing quotas have been proclaimed and rejected.

The 14 Steagall commodities are protected at the same 90 percent of parity rate for the same 2-year period. These are the commodities for which the Secretary of Agriculture has asked by formal proclamation for wartime production increases.

The postwar price support period begins on the January 1 after the official "end of hostilities," as declared either by presidential proclamation or by congressional resolution.

World War I hostilities didn't end officially for nearly 2½ years after the Armistice. President Truman's declaration of VJ-Day does not constitute the official end of hostilities

Thus, the postwar price support period is certain to run through 1947, probably will run through 1948, and might run beyond 1948. The President isn't expected to declare hostilities at an end until some time next year—too much of his reconversion authority depends on the official end of the war. Wartime powers to control prices, allocate materials, draft men into the Army, etc., expire within 6 months after hostilities officially end.

The average U. S. farm price for soybeans Aug. 15 was $2.12 a bushel. Present price support is $2.04 a bushel. "Comparable" parity price for soybeans (they have no 1910-14 parity base so a "comparable" parity price is calculated) on Aug. 15 was $1.66 a bushel.

Should the support price on soybeans produced after next year fall to the legal minimum, they would drop to $1.49½ a bushel if the parity relationship remained unchanged. The 5-year (1935-39) U. S. average farm price for soybeans as reported in the USDA statistical yearbook was 86½ cents a bushel.

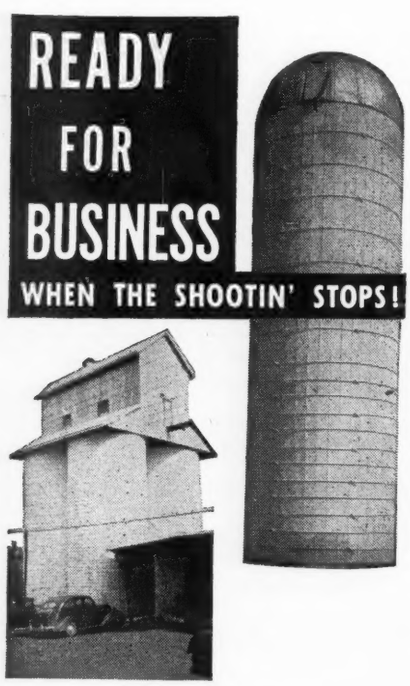
There is fairly general agreement that price supports will be assured only on a producer's share of a desired national production (or crop goal), and that all or part of existing AAA machinery will be used.

Linked with this is the idea, expressed in the reports of former Reconversion Directors Byrnes and Vinson, of letting prices seek their own market level and making up the differences in direct payments. Such a system might be applied to the basic crops which can be stored.

The system might also be used as the support mechanism for soybeans by use of a soybean loan, similar to those now in effect.

Most officials feel that there will be several types of price support devices used during the postwar period, depending upon the crop and the nature of its market. Next year is expected to be the year of small-scale experimentation, during which the patterns for the longer pull will emerge.

By PORTER M. HEDGE
Washington Correspondent for The Soybean Digest



Grain and bean storage is important to both grower and elevator. Neff & Fry bins provide that extra capacity you will need. The answer to maximum storage operating efficiency lies in specialized designing — a service which we are more than equipped to render, having completed hundreds of contracts for storage of any material needed in your business. Bins in any capacity. Guaranteed. Trained erection crews. Get catalog — and have us quote on your needs.

THE NEFF & FRY CO.
CAMDEN, OHIO

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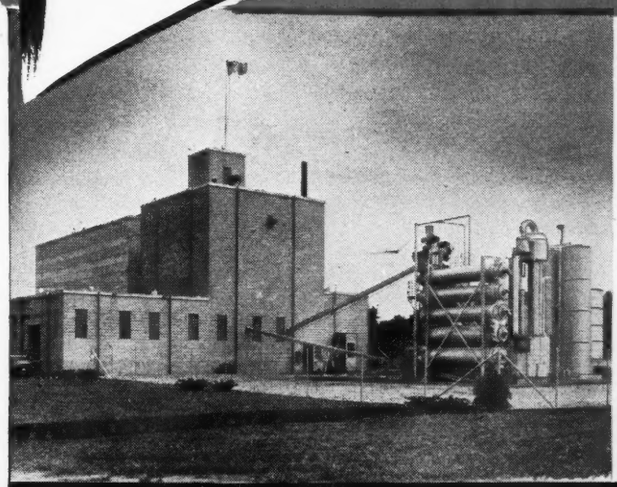
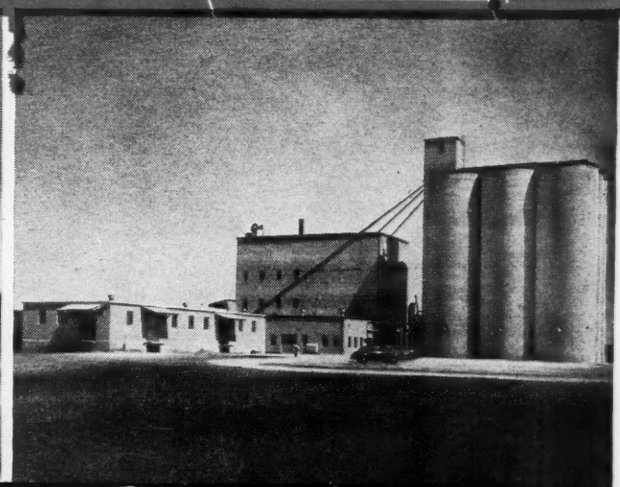
GRAIN
STORAGE

Again HONEYMEAD does it!





HERE ARE THE TWO *Just completed* HONEYMEAD MODERN PLANTS LOCATED AT WASHINGTON and SPENCER, IOWA

The two new HONEYMEAD plants in Washington, Iowa and Spencer, Iowa represent the latest advancement in *extraction-type* soybean plants. They are entirely new *in idea*. They are entirely new *in method*. They are most advantageously located. The result is . . . that HONEYMEAD Soybean Meal is uniformly of the highest quality.

Equally new-day is the HONEYMEAD equipment and laboratory control in these plants . . . for mixing proteins, minerals, vitamin sources and Dextrose that go into scientifically balanced HONEYMEAD mixed feed supplements. The result must be . . . HONEYMEAD Balanced Proteins of greatest *feeding efficiency* and *feeding economy*.

What this means to SOYBEAN GROWERS

As the production and number of HONEYMEAD plants is increased . . . as more and more livestock feeders and poultry raisers feed HONEYMEAD Balanced Proteins—the HONEYMEAD PRODUCTS COMPANY will become a constantly growing outlet for soybeans . . . will play an even more important part in the expansion of the great soybean industry.

The Honeymead Products Company is proud to be listed among the membership of the American Soybean Association.

HONEYMEAD
PRODUCTS CO.
CEDAR RAPIDS, IOWA
Plants: WASHINGTON and SPENCER, IOWA

BROWN

(Continued from page 35)

for the payment of the $600 annual license fee.

The production of and trade in margarine is also subject to additional regulations in every state with the exception of Arizona, New Mexico, Oklahoma and West Virginia. Twenty-four states prohibit the manufacture and sale of colored margarine; the use of margarine in institutions supported by state funds is prohibited in several states; in 18 states manufacturers of and dealers in margarine must secure licenses from the state upon payment of a specified fee which is in addition to the fee they must pay to the federal government; a variety of detailed labeling requirements are enforced in practically all of the 44 states legislating with regard to margarine.

In addition to the federal government, 21 states also tax the sale of margarine. These taxes range from as much as 15c a pound in Wisconsin and Washington to 5c a pound on uncolored margarine in Iowa and Utah. Wyoming exempts margarine containing more than 20 percent animal fats and oils from the state tax, and in Minnesota margarine having more than 65 percent animal fats and oils is exempt. In May of this year, a similar law in Nebraska exempting margarine with more than 50 percent animal fats and oils from the 15c per pound tax was held by the supreme court of that state to be unconstitutional.‡ It was the opinion of that court that inasmuch as the color, body, nutritional value and usability of margarine made from 50 percent or more vegetable oil was the same as that of margarine made from 50 percent or more of animal fats, the former could not be subjected to a tax from which the latter was exempt.

Eleven of the 21 states taxing margarine exempt margarine made from domestic fats and oils from the state tax. *Louiana, South Carolina and Texas were the first to include margarine containing soybean oil in the tax exemption.* This was in 1934. Arkansas, Georgia, Maine and North Carolina followed the next year. By 1943, Florida, and Tennessee had amended their laws accordingly. Colorado and Kansas extended their exemptions to include margarine made from soybean oil during the current legislative year. In 1935 the Georgia Supreme Court held that such a classification for the purpose of imposing an excise tax was reasonable.§ It was the opinion of the Georgia court that the state has the constitutional power to encourage domestic industries in this manner. This is to be distinguished from the Nebraska case in which the tax involved operated to foster certain local industries at the expense, however, of certain other local industries.

The soybean grower may well ask why margarine is subjected to such discriminatory treatment. Scientists and nutritionists agree that it is a healthful, nutritious food. It is made from the products of American farms. It is cheaper than butter. The organized dairy industry has abandoned any subterfuge in its fight to maintain or even increase existing legal restrictions against margarine. They admittedly fear the effects on the butter market of the free and unrestrained flow of an equally nutritious but cheaper spread for bread. No attempt will be made to evaluate the merit of this fear other than to say that it is believed that any serious dislocations of butter resulting from the unrestricted sale of margarine are highly improbable. The significant fact is that it has been possible for one American industry through legislation to restrict and, in some instances, exclude another industry equally American for no other reason except that the latter may compete with the former in the same market. This is particularly significant in this country where "free competition" and the rights of individuals to pursue any calling not inimical to the public welfare are basic concepts.

‡**Thorin v. Burke**, May 11, 1945.
§**Coy v. Linder**, 183 Ga. 583, 189 S.E. 26.

Expeller Fundamentals No. 6

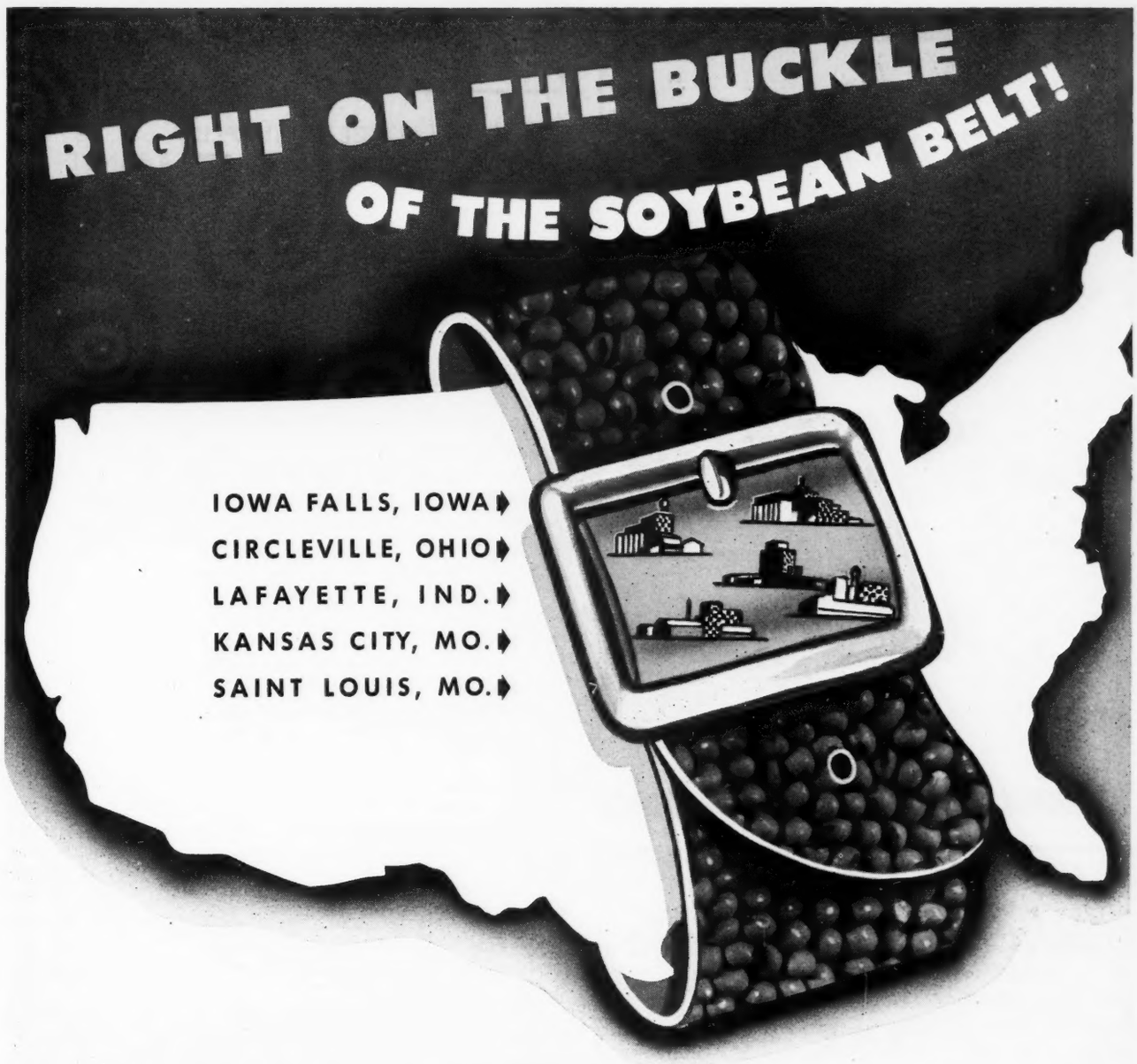
44 YEARS OF EXPELLER EXPERIENCE

● The most important Expeller Fundamental is Anderson's 44 years of experience in manufacturing continuous presses. Since 1901, Anderson has been accumulating experience in the design and operation of Expellers that is unequalled by any other continuous press or press parts manufacturer. Expeller engineers patented the Expeller principle; discarded the cone choke mechanism in favor of the automatic choke; originated 2-in-1 pressing; originated oil cooling and made countless other improvements in Expellers and Expeller parts. This experience is yours in every Expeller you install. Check Expellers for your needs.

1945 MODEL
Twin-Motor Super Duo Oil Expeller

THE V. D. ANDERSON COMPANY
1935 West 96th Street • Cleveland 2, Ohio

RIGHT ON THE BUCKLE OF THE SOYBEAN BELT!



PURINA MILLS NOW HAS . . .

5 SOYBEAN PROCESSING PLANTS OR— CASH MARKETS for Soybean Growers

With the addition of its Kansas City soybean plant this year, Purina Mills provides another in a chain of strategically located markets for you soybean growers. If you raise poultry or livestock . . . feed Purina Chows which use your soybean meal as a major protein source. In today's fight as well as tomorrow's peace-time food production . . .

BUY THE FEEDS THAT USE THE SOYBEAN . *Buy Purina Chows*

for

ABUNDANT YIELDS

of

HIGH GRADE SOYBEANS

treat soil with

RUHM'S PHOSPHATE ROCK

Even 1 application usually results in marked improvement in quality and quantity of soybeans and other crops the first year . . . and following years.

Deliveries slowed by present day conditions.
Best to order way ahead.

RUHM PHOSPHATE & CHEMICAL CO.
MT. PLEASANT, TENNESSEE

We Congratulate

THE

American Soybean Association

on their

Remarkable Progress

★

VICTORY MILLS LIMITED
TORONTO **CANADA**

In The MARKETS

SMALLER SOYBEAN SUPPLIES REFLECT INCREASED DISAPPEARANCE

Soybean stocks July 1 were 3 percent smaller than a year ago as a result of record crushings and heavy exports, the Office of Marketing Services reports. Based on conditions on August 1 the 1945 crop will be about 2.4 percent less than last year but more than double the 10-year average. Reflecting the heavy demand, farm prices are the highest since 1928.

Soybean stocks on July 1 amounted to 46,525,000 bushels compared with 48,046,000 a year ago and 47,386,000 bushels two years ago. Stocks were larger in all positions except in steel and wooden bins owned by the Commodity Credit Corporation and on farms where only 7,749,000 bushels were held compared with 10,858,000 bushels a year earlier. Well over half the July 1 stocks of 26,387,000 bushels were stored at crushing plants compared with 23,712,000 bushels stored a year earlier. Commodity Credit Corporation stocks amounted to only 957,000 bushels on July 1 which was only about ¼ the 3,824,000 bushels in Commodity Credit Corporation storage a year ago.

Disappearance of soybeans, October through June, amounted to 160,670,000 bushels this season. This was 3 million bushels more than for the same period last season and 15 million more than for the same months of 1942-43. During the April-June quarter disappearance of soybeans amounted to 63,249,000 bushels, or 2 million bushels more than the same quarter last year. This, however, was 5.5 million bushels less than disappearance during the same quarter of the 1942-43 season.

Crushing of soybeans for oil, as reported by the Bureau of the Census totaled 42,074,000 bushels in the April-June quarter. This compares with 36,814,000 bushels crushed in the comparable months last season and 40,294,000 bushels in the January-March quarter this year. Crushings for the first 9 months this season amounted to 114,220,000 bushels compared with 110,445,000 last season and 104,786,000 two years ago. Soybeans crushed for flour and grits amounted to 527,000 bushels in the April-June quarter which was slightly less than the previous quarter and about 20 percent less than a year ago.

Exports of soybeans increased greatly during the 3rd quarter of this season amounting to 2,456,000 bushels. This compares with 215,000 bushels exported during January-March and 139,000 bushels exported in the April-June quarter last year. Exports thus far this season are the largest since 1939 when they totaled 11,833,000 bushels. The following countries received the bulk of the exports during the April-June quarter: Canada 252,000 bushels, United Kingdom 175,000, Netherlands 603,000, Belgium 425,000 and France 986,000 bushels.

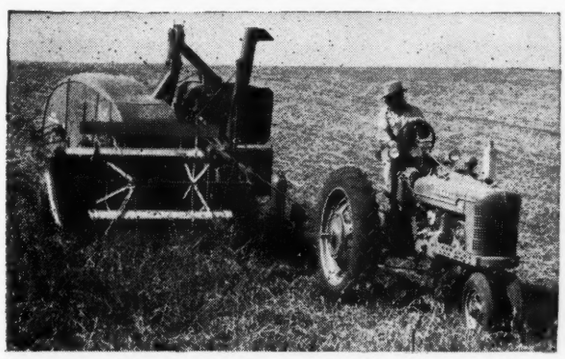
A 1945 soybean crop of 188,284,000 bushels was in prospect August 1. This is nearly 4.6 million bushels less than was produced last year but is more than double the 10-year (1934-43) average production of 86,732,000 bushels. A yield of 18.1 bushels per acre was indicated August 1, slightly less than last year's yield of 18.4 bushels but above the 1934-43 average of 17.6 bushels per acre. The 1945 acreage of soybeans for harvest for beans is estimated at 10,392,000 acres compared with 10,502,000 acres harvested in 1944 and 4,812,000 acres, the 10-year average.

Urgent demand for soybeans for domestic use and for export have advanced prices to the highest level since 1928. For the first 10 months of this season prices received by farmers for soybeans averaged $2.10 per bushel compared with $1.86 received in the same months last season and $1.64 the same months of the 1942-43 season. Prices received by farmers in July averaged $2.16 per bushel compared with $1.91 a year earlier and $1.18 the 10-year (1934-43) average. The 1945 soybean crop will be supported at the same price as last year's crop which was $2.04 per bushel to farmers for No. 2 Green or Yellow or better.

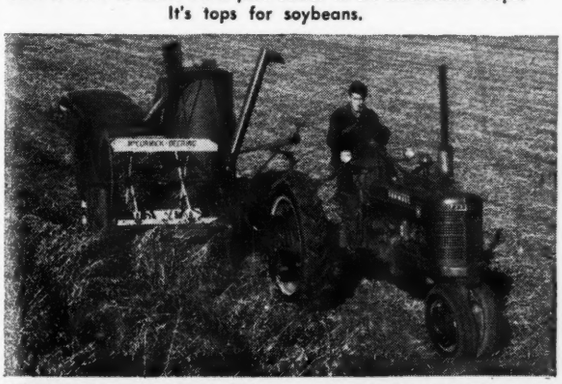
Combines for Soybeans

Work Reports Show Low Per Acre Threshing Costs With These Combines

McCormick-Deering No. 123-SP harvester-thresher harvesting soybeans in Illinois. The self-propelled No. 123-SP is a one-man machine with 12-foot cut.



The McCormick-Deering No. 62, a 6-foot harvester-thresher, gives you economy, capacity, performance, convenience, and greater profits. (Below) The 5-foot McCormick-Deering No. 52-R is built to make hard jobs easier in all threshable crops. It's tops for soybeans.



► Work reports prove that the best way to harvest soybeans is with modern McCormick-Deering harvester-threshers—the No. 123-SP, the No. 62, or the No. 52-R depending upon crop acreages.

The report submitted by Glen Nicholson, Peoria, Illinois, is typical. With the McCormick-Deering No. 123-SP, self-propelled, 12-foot harvester-thresher, he harvested 725 acres of beans, averaging 25 acres per day. Cost was $3.40 a day for oil, fuel, grease, and repairs, or 14 cents per acre. Harvest ran 29 consecutive days, from October 6 to November 4. Mr. Nicholson harvested the entire 725-acre crop by himself, without help.

Capacities of the McCormick-Deering No. 62 and No. 52-R harvester-threshers are in proportion to their size. The No. 62 is the six-foot machine, and the No. 52-R affords a five-foot cut. Both offer the latest advantages in pull-type combine design. See them at work.

Ask your International Harvester dealer to explain the features of McCormick-Deering harvester-threshers and how they will cut costs on your farm. Let him recommend the size and type best suited to your needs.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

McCORMICK-DEERING HARVESTER-THRESHERS

PUT A GREAT REPUTATION
BEHIND YOUR OWN . . . USE

FAIRBANKS-MORSE

Scales

THE world-wide reputation of Fairbanks-Morse Scales for accuracy will help establish customer confidence. When you install one, you've solved your weighing problems for years to come.

No job is too tough, or too big for Fairbanks-Morse Truck Scales. They're engineered to last, built to assure utmost accuracy under any and all conditions. And they retain their accuracy for life. Over 115 years ago Thaddeus Fairbanks established principles still used in modern scales. Since he began working to improve weighing, we've never stopped.

For details, write Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

Feather responsiveness . . . powerful, precision-built mechanism . . . fast, accurate reading. Shown is a Truck Scale with cabinet dial. Also available with full capacity beam.

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A name worth remembering

Diesel Locomotives • Diesel Engines • Generators
Motors • Pumps • Scales • Magnetos • Stokers
Railroad Motor Cars and Standpipes • Farm Equipment

Stocks of Soybeans, July 1, 1945, with Comparisons

Position; Reported by	July 1 1944	April 1 1945	July 1 1945
	—Thousand Bushels—		
On Farms—			
Crop Reporting Board	10,858	27,852	7,749
Int. M.E. & Warehouses—			
Crop Reporting Board	4,970	30,012	6,031
Processing Plants—			
Bureau of the Census	23,712	32,640	26,387
Terminal Markets—			
Office of Mktg. Services	4,682	16,508	5,401
Steel and Wooden Bins—			
Commodity Credit Corp.	3,824	2,762	957
Total All Positions	48,046	109,774	46,525

Stocks of Soybeans in Mills, Elevators and Warehouses and Other Establishments* July 1, 1945, with Comparisons

State	July 1 1944	April 1 1945	July 1 1945
	—Thousand Bushels—		
Ohio	600	2,324	328
Indiana	691	2,840	440
Illinois	1,525	14,630	2,121
Michigan	52	85	1[illegible]
Minnesota	68	198	51
Iowa	1,745	9,229	2,816
Missouri	59	123	83
Nebraska	1	52	1
Kansas	51	168	19
Virginia	16	10	2
North Carolina	6	100	4
Mississippi	5	26	1
Arkansas	16	14	1
Other States	135	213	149
U. S.	4,970	30,012	6,031

*Excludes stocks in processing plants enumerated by the Bureau of the Census and stocks at 43 terminal markets reported by the Office of Marketing Services.

● INSPECTIONS. Inspected receipts of soybeans have decreased steadily for the past three months, according to inspectors' reports to the Grain Products Branch of the Office of Marketing Services. July receipts totaled 3,063 cars compared with 3,642 cars in June, 5,593 cars in May, and 6,588 cars in April. Inspected receipts October through July this season were 81,246 cars, a slight increase over 80,916 cars inspected during the same period last season.

The quality of the soybeans inspected in July continued good, 88 percent grading No. 2 or better compared with 87 percent in June. October through July, both this season and last, 53 percent graded No. 1 and 34 percent No. 2.

Inspections of soybeans in July included the equivalent of 385 cars inspected as cargo lots, and truck receipts equivalent to 27 cars.

● SOYBEAN STOCKS. War Food Administration commercial grain stock report.

U. S. Soybeans in Store and Afloat at Domestic Markets (1,000 Bu.)

	Aug. 7	Aug. 14	Aug. 21	Aug. 28
Atlantic Coast	140	141	110	99
Gulf Coast	1165	1146	1243	869
Northwestern and Upper Lake				
Lower Lake	209	152	128	64
East Central	982	759	721	609
West Central, Southwestern & Western	461	384	315	254
Pacific Coast				
Total current week	2957	2582	2517	1895
Total Year ago	2415	2085	1924	1729

Total North American Commercial Soybean Stocks (1,000 Bu.)

Current week	2957	2582	2517	1895
Year ago	2658	2355	2194	1989

● SOYBEAN OIL IN SHORTENING. Primary oils and fats used in manufacture of shortening totaled 1,310 million pounds in 1944, compared with 1,371 million pounds a year earlier. In addition, some vegetable oil stearin, a secondary product, apparently was used. Production of shortening totaled 1,363 million pounds in 1944. Soybean oil comprised 47 percent of all primary oils and fats used in 1944 compared with 42 percent in 1943. Use of cottonseed oil declined from 42 to 37 percent of the total. This shift was due to the relative abundance of soybean oil in 1944 and Government allocations. For nearly 2½ years, refined cottonseed, peanut, soybean, and corn oils have been allocated to manufacturers for specific uses under WFO 29.

● STANDARD SHORTENING SHIPMENTS. By members of Institute of Shortening Mfgrs., Ind., in pounds.

August 4	6,990,077
August 11	7,434,488
August 18	5,946,097